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The Effect of Spatial Density on the Social and Cognitive Play Behaviors of Children in a Day Care Center

by

© Dianne Elizabeth Fishburne

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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submitted by Dianne Elizabeth Fishburne

in partial fulfilment of the requirements for the degree of Master of Education

Supervisor

Date September 21, 1981

DEDICATION

This thesis is dedicated to the special people in my life. To my husband, Graham, whose love and encouragement has meant so much during the completion of this thesis. Also, to our new daughter, Stephanie Lynn, who is now such an important part of our life.

Finally, to my parents who did so much to instill in me the importance of education. For this I will always be grateful.

ABSTRACT

This research was an attempt to learn more about the interaction between the degree of spatial density and four and five year old children's play behaviors in a day care center. Social play, cognitive play and non-play behaviors of 44 children (mean age of 4.5 years) were examined during the spatial density conditions of low density, high density, and a return to low density. Other factors examined were room (two experimental rooms and one control room), time of day (morning and afternoon), sex and children's age (younger than 4.5 years and older than 4.5 years).

Data were collected by trained observers who used a point-time sampling technique. Each child's play and non-play behaviors were coded during the children's free-choice play period over 33 consecutive days. The data collected were analysed by the exploratory technique (Tukey, 1977). The percentage of time that the children spent in each of the play and non-play categories during the three density conditions were compared. Only variations in the scores of the two experimental rooms which exceeded those variations of the control room were considered to be of importance.

The effects of changing spatial density in both experimental rooms were analysed. The children spent an increase of time in non-play and they also displayed less social interactions during the high density condition. This was more evident in the afternoon for one room and also more evident for the younger children in both experimental rooms. The children in each room displayed different play behaviors and this led to an examination of what factors were operating to create these differences.

The implications from the findings suggest that the spatial density of a day care center should not exceed the range 2.9 m /child to 4.4 m /

child. This is based on the fact that some children's play behaviors were adversely affected during the higher spatial density condition.

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CHAPTER ONE:

Introduction to the Study

Early childhood researchers have determined that child-rearing environments influence children's behavior. Differences in environments have been found to induce differences in experiences creating a concern for the quality of children's experiences in the surroundings in which they function. The term *environment* can include physical context, action context, social context and life space (Gump, 1978). In a preschool environment these factors can best be illustrated by the physical setting, the objects in the setting, the program, and the adults and children present within the setting. The life space relates to each child's personality and other individual factors such as past experiences (Chaplin & Krawiec, 1968). The physical setting factor includes the amount and type of space (Katz, 1970). This study examined spatial density which is one aspect of the physical environment important to child behavior.

Several spatial characteristics of preschool environment have been found to influence children's behavior. Hoffman (1976) and Prescott, Jones and Kritchevsky (1972) examined the quality of space, Scholtz and Ellis (1975) examined the familiarity and complexity of play objects (setting). Massing (1979) and Shure (1963) looked at how children use their space during play. Connolly and Smith (1978), Loo (1972, 1976, 1979), McGrew (1970) and Shapiro (1975) examined the effects of varying spatial densities on children's behaviors. All these researchers have found that different spatial characteristics affect children's behaviors.

Child-rearing environments are considered significant because a child's child's early years are considered to have a very important impact on growth and development. Experiences during these years play an important role in child development (Ambron, 1975; Bloom, 1964; Hunt, 1961). In

the preschool period from age two to age five a child makes great physical, social and cognitive developmental progress. During these years children advance in strength, speed and coordination, allowing gains in independence. The child develops a language enabling him to question and understand. The child also develops a longer attention span, and physical coordination and skills increase enabling more control over play materials. Perceptual awareness develops allowing for problem solving and understanding. As the child becomes more capable, she becomes more interested in the world around. The child attends to structures in the environment and organizes his perceptions into higher forms of thought. As the preschool child develops, she moves from simple repetitive actions to representation through imitation. When children combine fantasy and play in a complex form of imagination imitation they learn to interact with others and begin to lay the foundations of interpersonal relationships. Friendships are created and children begin to play cooperatively with others. As children establish friendships, this marks an important step in their awareness of other people as distinct and unique individuals.

A child's development is seen as a function of the interaction between the child and the environment (Barker, 1968; Ittelson, Proshansky, Rivlin & Winkel, 1974; Lee, 1976; Lewin, 1931; Piaget, 1962). Caldwell (1971), Ellis (1973), Frost and Kissinger (1976) and Hunt (1961) stress the role of early interaction between child and environment. They encourage the need for a rich and varied environment that allows the child to use previous learnings for further development. Caldwell best describes the environmental conditions that provide for optimal growth and development. She lists as necessary conditions: gratification of basic physical needs, provisions for health and safety, high frequency of adult contact, a positive emotional climate, a variety of sensory input, a minimum of

social restrictions on exploratory and motor behavior, availability and utilization of play materials, and the cumulative programming of experiences that provide an appropriate match for the child's current level of cognitive, social and emotional organization (p. 263). It is important to examine how variations in these conditions influence children's experiences and in turn how this influences children's development.

One means used to determine the impact of an environment has been to examine children's play behaviors within this environment. Play theorists have stated that the type of play is important both as a precursor of later play modes and as an indication of the child's development (Bruner, 1976; Piaget, 1962; Smilansky, 1968; Sutton-Smith, 1971). Neumann (1971) determined the criterion conditions necessary before a child will be freed to play. Ellis (1973), in summarizing these conditions, states that first a child's basic needs for food, health, warmth, and security must be met. The additional conditions are

> if the locus of control of the behavior is vested in the individual, if the behavior is intrinsically motivated . . . and if the child should transcend the immediate constraints of the reality of the situation when playing (p. 123).

Biber (1971) stated that play in the early years allows the child to learn about the world by playing with it and provides an outlet for complex and conflicting emotions. Research shows that various factors present in an environment may affect play behaviors. The differences in physical settings, the space and materials available appear to create different types of play behaviors (Frost & Campbell, 1978; Kinsman & Berk, 1979; Loo, 1972, 1976, 1979).

Assuming that the environment has an important effect on young children's behaviors leads one to stress the importance of studying the

environments in which children spend their time. Many Canadian preschool children spend a large portion of their early childhood years in a day care environment. In 1979, there were 78,653 Canadian children registered in full-time group day care programs. The number of children needing day care has risen greatly in the 1970's, and is seen in the increase of 10,766 more children in day care from 1978 to 1979 (National Day Care Information Center, 1979). The increase in the number of single parents and the number of both parents working means more and more children will be spending the greater portion of their early developmental years in a day care center. Many children spend every day from early morning to late afternoon in a day care setting which consists of various ages of children, and a selection of equipment and materials (Frein & Clarke-Stewart, 1973; Gump, 1978; Prescott, Jones & Kritchevsky, 1972). All these variables interact with one another to produce a unique environment.

However, the standards vary widely. The need for some quality controls on the day care environment is generally agreed upon as evidenced by the universal existence of day care standards in North America. With regard to space, there has been little research done to define optimal density (child to space ratio) for young children in a day care center. The Child Welfare League of America (1972), accepted as a recognized accreditation agency, advocates that the amount of playroom space per child should be 4.6 square meters (50 ft^2) and should not be less than 3.25 square meters (35 ft^2) per child. The Canadian Council of Social Development (1973) propose 3.7 square meters (40 ft^2) per child to be the optimal ratio adopted by day care reguations and that 3.25 square meters (35 ft^2) be the minimum space required in full time day care centers.

In Canada, day care regulations are the responsibility of the provincial government and standards vary from 2.32 square meters (25 ft^2) per child in Manitoba and Quebec to 3.72 square meters (40 ft^2) in Newfoundland (Mathien, 1978). Alberta's density regulation has been most recently adopted and is one of the lowest in Canada. Alberta's regulation requires 2.5 square meters (26.9 ft^2) per child for a licensed day care center (The Social Care Facilities Licensing Act: Day Care Regulations, 1978). The City of Edmonton Social Services requires 3.25 square meters (35 ft^2) per child as minimum criterion for its subsidized day care centers (City of Edmonton, 1980).

The early years of a child's development are very important ones for growth and development. The quality of experiences the child has depends upon the child's interaction with the environment. Adequate space is an important aspect of a child's physical environment. However, there is a lack of empirical evidence on the effect of differing spatial densities on children's behaviors. The lack of research and the present differences in requirements regarding what is adequate space for young children suggest a need for additional research to determine if the amount of space available to children is important to their growth and development.

The Problem

The problem in this study dealt with the effect of differing amounts of space on the social and cognitive play behaviors of three, four and five year old children in a day care center. The social categories include levels of solitary, parallel and coordinated play. The cognitive categories include exploratory/functional, constructive, imitative/dramatic and testing/contesting levels of play.

Definitions

For the purpose of this study, the following definitions were used:

Free-choice play: play which occurs when the children are generally free to move about the room and choose their own activity. The teacher may offer suggestions to groups or individuals but she does not restrict children from a free play activity. The teacher may set up special activities but does not insist on involvement, nor does she exclude children (except if materials or space is limited). The teacher helps with difficulties and provides behavioral limits: helps to resolve quarrels, stops disruptive behavior, helps direct diffuse behavior, helps an uncertain child into something (Hoffman, 1976).

Spatial density: the number of square meters or feet of floor space per child.

Spatial density change: the number of children in the group is held constant while floor space available is varied.

High density: approximately 2.5 square meters (26.9 ft^2) per child. An attempt was made to match the provincial guidelines as closely as possible.

Low density: approximately 4.3 square meters (46.3 ft^2) per child. The total area of the space that was accessible to the children was 86.7 square meters. This was within the acceptable recommendations of the Child Welfare League of America for an optimal ratio for day care centers.

Day care center: the licensed facility and program for the provision of care, maintenance and supervision within a dwelling unit for periods of more than three but less than 24 consecutive hours for children between the ages of three and six (The Social Care Facilities Licensing Act: Day Regulations, 1978).

Low density condition: the time period during which the experimental and control rooms were subjected to the low density.

High density condition: the time period during which the experimental rooms were subjected to the high density.

Low density returned condition: the time period during which the experimental rooms returned to the low density condition.

Time period 1: days one to ten of the study during which time the experimental and control rooms were subjected to the low density condition.

Time period 2: days 11 to 25 of the study during which the experimental rooms were subjected to the high density condition and the control room remained in the low density condition.

Time period 3: days 26 to 33 of the study during which time the experimental rooms returned to the low density condition and the control room remained in the low density condition.

Solitary play(s): the child plays alone and independently with *toys or materials that are different from those* used by the children within speaking distance. He makes no effort to get close to other children. The child pursues his own activity without reference to what others are doing.

Parallel play (P^-, P^+): the child plays independently but the activity he chooses naturally brings him among other children. He *plays with toys or materials that are like those* which the children around him are using, but he plays with the toy as he sees fit. The child does not try to influence or modify the activity of the children near him. He plays *beside* rather than *with* the other children. There is no attempt to control the coming or going of children in the group.

The child may show evidence of awareness of another child's presence by looking or imitating. Language does not always occur (parallel play *with no* language P^-) but if it does occur it may not relate to the activity (parallel play *with* language P^+). If language does relate to the activity it will be a simple statement that does not require a reciprocal reply.

Coordinated play (C): the child plays with other children. The children may follow one another with trains or wagons. They will attempt to control which children may or may not play in the group. The child subordinates or incorporates his own interests to the purposes of the group. The children play in a group that is organized for the purpose of making some product, or of striving to attain some competitive goal, or of dramatizing situations of adult and group life, or of playing formal games. The control of the group situation is in the hands of one or two of the members who direct the activity of the others. The goal as well as the method of attaining it necessitates a division of labor: taking of different roles by the various group members and the organization of activity so that the efforts of one child are supplemented by those of another. All language relates to the activity and demands reciprocating interaction.

Exploratory/functional play (EF): simple *repetitive* muscle movements with or without objects aimed at satisfying or entertaining *sensory consequences*. Consists of simple muscular activities. The child repeats his actions and manipulations, imitates himself, tries new actions, imitates them, repeats them, and so on. Practicing or doing repeatedly a skill that is already within the child's capacity. Shaking, rattling, banging, throwing, dropping, searching, spatial arrangements for "the fun of it." The child displays simple investigatory reactions toward an

object and its stimulus qualities.

Constructive play (C): it is the manipulation of objects to construct or to create something. The child realizes himself as a "creator". Examples of construction activities are: building, molding, painting, cutting, pasting, shaping materials.

Imitative/dramatic play (ID): the substitution of an imaginary situation to satisfy the child's personal wishes and needs. The child pretends or makes believe that one object is another (a stick is a gun), ascribes to an object actions of self or others (a doll is her sister). The child takes on a role, pretending to be someone else. He imitates a person in action and speech, with the aid of real or imagined objects. The child tries to reproduce the world of adults through make-believe, pretending and imagining. The child may also do this through the use of props, gestures or facial expressions to indicate imagination.

Testing/contesting play - games-with-rules (TC): it is like prediction. The child predicts what he can do and then attempts to try himself out in a variety of ways. He directs his actions to "What I can do." The child tests himself and attempts to achieve a result. Children may compete with one another for some final outcome. This category of play may include competitive games of strategy, change and physical skill. The child accepts prearranged rules and adjusts to them. He learns to control his behavior, actions, and reactions, within given limits. Often regulations are imposed by the group with a sanction for violation.

Non-play (NP): included all other non-routine (O) and routine (R) categories of activity. Non-routine activities included no observable activity, onlooker, wandering, transition, waiting and conversation. Routine activities included snack, tidying, washroom, tie shoes, and

getting materials. For detailed sub-category definitions see Appendix A.

Research Questions

The research questions that this study attempted to answer were as follows:

1. What differences occurred between scores for children during two different spatial densities for the categories of social play:

   (a) solitary play

   (b) parallel play

   (c) coordinated play

   (d) non-play

2. What differences occurred between scores for children during two different spatial densities for the categories of cognitive play:

   (a) exploratory/functional play

   (b) constructive play

   (c) imitative/dramatic play

   (d) testing/contesting play

3. Does a period of time spent in a high density condition have a subsequent effect on the way children play in a low density condition?

Assumptions and Limitations of the Study

1. The play categories used in the study are assumed to represent a complete and accurate picture of children's play behaviors during free-choice play.

2. It was also assumed that the play behaviors would be perceived and coded similarly by all the observers.

3. The children and setting selected for this study may not be representative of other day care center children and settings; therefore, the findings may not be generalizable.

4. The total time of observation of the study represents only a limited part of the total time spent by the children in the center and may not represent an accurate picture of the children's behaviors.

Significance of the Study

1. It is important for parents and educators to better understand the effect of a day care environment on young children. This study provides additional information regarding the variables involved in a child-rearing environment and the possible effects.

2. This study provides additional information on the effects of specific spatial densities to those people who plan environments for young children.

3. The study may provide other investigators with additional information regarding the reliability of the child scan technique for measuring children's behavior.

Outline of the Thesis

This chapter has introduced the study by briefly developing the background to the importance of additional research to determine if the amount of space available to children is important to their growth and development. Research questions were developed to investigate the effect of spatial density on the play behaviors of children. The definitions used for the purpose of the study, the limitations and significance of the study were discussed.

In Chapter Two, the theoretical foundations of environment/play studies are discussed, followed by a review of literature in the areas of environment and play and the methodology of studying children's play. The design of the study, the setting, the subjects and the methodology of the study are discussed in Chapter Three. In Chapter Four the results

of the data analysis are presented. Finally Chapter Five deals with the conclusions and implications of the study.

CHAPTER TWO:

Background to the Study

Chapter two is comprised of two parts: a review of the literature regarding environmental influences on behavior, followed by a review of the literature concerning the variables affecting the play behaviors of children. In the first part, the theoretical positions on the relationship between man and the environment are reviewed with a closer look at how the environment affects young children. Also included is a review of studies which examined the effects of varying social and spatial densities on children's behaviors.

The second part of the chapter examines several play theories and the development of the social and cognitive play categories associated with each theory. Also included are studies that examined variables which affect play behaviors of children.

Methods which employ the point-sampling technique for observing children are presented throughout the chapter in conjunction with the review of studies from each of the perspectives presented above.

Man and His Environment

The relationship between man and his environment has been studied in both environmental and ecological psychology (Barker, 1968; Gump, 1974, 1978; Ittelson, Proshansky, Rivlin & Winkel, 1974; Lee, 1976). This man-environment relationship can best be described as an interaction in which human behavior influences and is influenced by the environment. Lee (1976) described this interactionist approach as a dynamic interchange between man and his environment. The effects of one cannot be separated from the other and both the environment and individual factors interact to produce behavior. This behavior does not occur without some perception

of the environment, perceptions which are dependent upon cultural and social norms, age, the specific situation and individual idiosyncrasies. Differences in people create differences in the perception of the environment and therefore differences in behavior.

Also, the environment induces similar setting-specific behaviors from the majority of persons in a particular setting. These "standing patterns of behavior" are often stronger than individual differences of the people in the setting and account for the similarities of behaviors found in particular settings like churches, theatres, schools, restaurants and stores (Gump, 1974).

Mischel (1973) also supported the idea that the environment has an impact on individual behavior. He stated that the result of environmental variation may be seen in the variation of individual behavior from one situation to another.

This man-environment relationship is important to examine in order to determine if there is a possible interaction between young children and the environment. Several studies found that changes in preschool environments cause changes in the children's behaviors (Kinsman & Berk, 1979; Loo, 1972, 1976, 1978, 1979; McGrew, 1970; Smith & Connolly, 1977). Examining the interaction between children and their environments will involve examining many variables within children's environments that may influence their behavior.

Environmental Studies in Preschool Settings

The interaction between children and their environment has created interest for early childhood researchers because of the importance of the quality of children's experiences in their environments. One important aspect of the environment with which the child interacts is

space. The quality of the space can influence the kind of experiences a child may have. Prescott, Jones and Kritchevsky (1972) measured the quality of the space using such indicators as the organization of boundaries, pathways, complexity and variety of equipment and the amount that there is to do. Trained coders scored the indoor and outdoor space in the center on the various dimensions using a 7-point continuum ranging from high to low quality. They found that children were more interested and involved in day care centers that were of medium size and where the space quality was rated as good than in those centers that were of smaller size and where the space quality was rated as low. They also concluded that the quality of space may determine the amount of freedom of teachers and children. They reported that high quality of space may allow for diversity and may offer more opportunities for more meaningful experiences. Low quality of space appears to force teachers into restricting activities and possibly results in less satisfying experiences for the children.

Hoffman (1976) also measured the quality of space and its effect on children's behavior during free play. She wanted to establish criteria for designing environments where children could function at a high level of involvement, without much adult restriction and direction. Involvement in the space was assessed by measuring the percentage of non-involvement during free play. The environments were rated for quality through the use of a modified form of the instrument designed by Prescott, Jones and Kritchevsky (1967) for studying playgrounds. Hoffman's results also showed that the rooms with the higher ratings for space quality had fewer uninvolved children. Hoffman also looked at the amount of space per child in each classroom and found no relationship between the number of square feet per child and either the quality of play space or the number of uninvolved children.

Some researchers have described and compared patterns of behavior as they occurred in a natural physical environment. Shure (1963) observed children in five indoor areas (art, book, doll, games, block) in a nursery school. Massing (1979) examined behaviors in 13 areas in a day care center, and Kinsman and Berk (1979) looked at just the housekeeping and block areas in a preschool setting. Shure and Massing both found that the physical size and materials in the areas encouraged certain behaviors. Shure reported that the largest area, the block area, was the most popular (especially for the boys) and the art area was second (preferred by the girls). The book area, the smallest in size, was the least popular. Children may have been able to occupy a larger space more comfortably and therefore seek it out. Massing also found the largest area (block/large movement) to be used the most by the children. She also discovered that two craft areas offered the same type of activities but were physically different; one was more enclosed and the other was more open, without boundaries. The area that was more enclosed showed more frequent use by the children as compared to the more open area. She suggested that children may feel more secure in a more enclosed area away from the stimulation from other areas. The children's use of the craft areas may have also been influenced by the presence or absence of a teacher. It appeared that a teacher was present more often at the area that was more open as opposed to the other. She suggested that usage of settings may have been related to the materials in or activities associated with the space, the size of the setting, and peer or teacher influence.

Shure (1963), and Kinsman and Berk (1979) noted differences in the children's play behaviors in various settings. Shure found more complex social interaction in the doll house. She also reported that the boys

were involved in more associative play and the girls in more cooperative play. Solitary play and complex social interaction were seen in the block room whereas parallel play was seen mainly in the art and book areas.

This differed from Kinsman and Berk's (1979) results which indicated that the housekeeping area was used for more solitary involvement and the block area was used for more grouped social play. This was more evident in the play of the younger children. Kinsman & Berk also examined the children's behavior in these two settings when the settings were separated and then again when they were joined. The separate environments encouraged same-sex interactions, a separation of the sexes, less integration of play materials and less constructive and involved play by children who entered an "opposite sex" area.

When the divider was removed and the two areas joined together the girls adapted more readily than the boys. The girls also showed an increase in relevant, constructive use of the block area. Solitary play and same-sex interaction decreased. The increase in mixed-sex play was seen mainly in the housekeeping area and mainly by the younger children. The older children's social patterns remained more stable. The older children resisted the changes made and often kept the boundaries clear by placing a barrier between the two areas. This behavior may have been due to the fact that these children were in their second year in the program and a change in a very familiar setting may have confused them. Also the authors suggested that the sex roles may be stronger than environmental pressures. The older children also showed an increase in integrating the play materials which may be due to an increase in cognitive development from nursery to kindergarten level. The authors of the study bring in many variables that may have been partly responsible

for the children's behavior; such as sex differences, length of time in the program, age differences, cognitive development, sex roles, and types of play materials. However there was no discussion about the fact that the children were observed at different times of the day which may have had an effect on the children's behaviors.

These studies of child-rearing environments have suggested the possibility of an interaction effect between the child and the environment. The higher quality of space appears to encourage more child involvement and offers more opportunities for meaningful experiences. Children's behaviors are affected by the size of and the materials available in a setting and also by the changes made in a setting. It also appears that children of different sex and age react differently to the settings and the changes in the setting.

Density Studies in Preschool Settings

The effects of varying levels of density on children's behaviors have been examined recently by several researchers. These studies have investigated children in differing levels of spatial density (same-sized groups in space of differing sizes) and then observed changes in the children's behaviors, particularly the social behaviors. McGrew (1970) examined the spacing behavior of twenty children in different spatial and social densities. She used two room sizes (100%, 80%) and two group sizes (100%, 50%) to determine the effects of four density conditions: 8.3 m^2/child (89 ft^2/child), 7.2 m^2/child (77 ft^2/child), 4.7 m^2/child (51 ft^2/child) and 3.6 m^2/child (29 ft^2/child). Every minute an observer noted each child's location on a "map" according to four spacing behaviors (contact, close proximity, intermediate proximity and solitary). There was no significant difference between peer contact (physical contact)

frequencies in any of the conditions. However, when density was at the highest level (3.6 m^2/child) there was a trend toward less physical contact. At the lower density there was a trend toward more physical contact. Peer proximity in the 7.2 m^2/child (77 ft^2/child) density condition was slightly higher but there was great similarity in the peer proximity frequencies for all conditions. Intermediate proximity (maximum possible distance apart = 2.5 meters or 8.25 feet) and solitary frequencies were greater in low density condition (8.3 m^2/child or 89 ft^2/child).

Close proximity was significantly higher when density was increased by spatial manipulations but not so when density increased by social manipulations. This suggests that differences in social density had a greater effect on the children's behavior. McGrew also concluded that preschool children are able to adjust their spacing behavior to changes in social and spatial density. However, the highest density condition (3.6 m^2/child) that she used might still be considered adequate for young children and therefore not necessarily be considered crowded.

Shapiro (1975) measured non-involvement of preschool children and its relation to spatial factors. She observed 274 four-year-olds in their natural preschool environment. Data were collected by two trained observers using a time-sampling technique which provided 20 observations per child. Non-involvement was defined as frequencies in deviant behavior, random behavior and onlooking behavior. She found that the most crowded rooms (less than 2.8 m^2/child or 30 ft^2/child) and the greatest amount of non-involvement, 26%. In classrooms of 2.8 m^2 to 4.6 m^2 (50 ft^2) per child non-involvement rose to 20%. The author suggested that crowded classrooms appear to create excess visual stimulation causing much distraction and frustration. This led to high rates of onlooking, deviant

and random behavior. On the other hand, children in overlarge classrooms also exhibited more random behavior. This may have been due to the cold and uninviting nature of the large room. This study supported the recommendation for preschool classroom space to be between 2.8 and 4.6 m^2/child, with more than the minimum 2.8 m^2 for day care centers.

Loo (1972) observed 60 four and five year old children in a high (1.4 m^2/child or 15 ft^2/child) and a low (4.1 m^2/child or 44.2 ft^2/child) spatial density condition. She examined the children in groups of six in two 48 minute sessions of free play in an adult-free situation. Loo reported that the children were less aggressive and interacted with fewer children in a spatially crowded condition. The crowded condition appeared to create restraints (physical and psychological) on the children causing fewer social behaviors. The boys displayed more aggressive behaviors than the girls and this aggression was more prevalent in the low-density condition. The subjects interacted with fewer children in the high-density condition and there was a trend to spend less time in group involvement and to spend more time in solitary play in high-density condition. Sex differences were evident in that boys interacted with more children than did the girls. The girls' activities were interrupted to a greater degree than the boys and these interruptions were more evident in the high-density condition. Girls displayed more dominant behavior toward other peers in the high-density condition than in the low-density condition. Because Loo found that children interacted with significantly fewer children and spent a lot of time in solitary play in the high-density condition, she concluded that a child may seek solitude in order to increase psychological distance from others when physical distance is limited. The trend for girls to be interrupted more frequently in high-density may also suggest that crowdedness may interfere with concentration, possibly resulting in

frustration.

Loo's first study did not show aggression to be evident in the high density condition but in a second study Loo (1976) investigated the effects of a low density condition of 4.1 m^2/child (43.7 ft^2/child) and a high density condition of 2.0 m^2/child (2.18 ft^2/child) on five behavioral styles. These styles included aggression, passivity (standing), self-involved play (solitary), avoidance (escape attempts and facing out) and the instability of activity (interruptions and toy changes). She observed 72 five year old children during 54 minutes of free play in an experimental setting. The room was equipped with a one-way mirror and microphones allowing the children to be seen and heard in the next room. There was no report provided on number of observations per child, how the observations were made or the reliability. There were significant effects for density on the children's behavior. Where a high density condition existed, the children displayed more aggression and interacted less positively, they became onlookers who stood rather than ran, walked or sat. The children used various methods of escape and avoidance, and their social play or toy play activities were more unstable and interrupted more frequently. Also there were sex differences in that boys tended to show greater effects than girls in the high density condition. The boys were more aggressive than the girls and showed the greatest amount of aggression in the high density condition. There was significantly more self-involved behavior in the low density than in the high density condition. It appeared that prolonged toy play was more difficult to achieve in crowded conditions. Loo suggested that the differences in the findings (Loo, 1972, 1976) might be due to the differences in the high density conditions. Given a higher density condition (1.4 m^2/child) Loo stated that the children might have been "catatonically" immobile, whereas

in the other high density condition (2.0 m^2/child) they were still able to attack and retreat (p. 4). In examining Loo's results, it must be pointed out that each group of children was exposed to each condition for just one session.

In a third study Loo (1978) examined individual differences in children's responses to high density conditions. She tried to find out what types of children might be more or less adversely affected by crowding and in what ways such an effect would be demonstrated. Teachers of 72 five-year old children scored the children's individual differences on a Preschool Behavior Questionnaire and each child was given a Draw-a-Line-Slowly test. The children were rated as high or low in hyperactivity-distractibility, hostility-aggressiveness, anxiety, behavior disturbance and motor inhibition. Groups of six children participated in two sessions of 54 minute free-play, adult-free situations. Each child was observed for a total of nine minutes by each of the six observers. The dependent variables examined were extent and quality of social interaction, activity mode and level, instability of activity, avoidance behaviors, effect and children's reported liking of others and the room. In general, Loo found that normal children adjust to a high-spatial-density condition to a greater degree than children who show evidences of some behavioral problems. Children with behavior problems tend to have more negative experiences in a high-spatial-density which may be due to the lack of ability to cope with the stresses of a crowded condition or to the fact that they may be more sensitive to a crowded environment. It appeared that anxious and impulsive children responded to crowded conditions by expressions of anger and distress.

In a another study, Loo (1979) investigated the effects of density on several different dimensions of behavior of 72 five-year old boys and

girls. She also examined the differential effects of density on far-personal-space children versus close-personal-space children. Personal space refers to an area surrounding a person's body into which intruders may not come or the area around a person within which anxiety is produced if another enters. Personal space was determined by the measure of body-buffer zone adapted for use with younger children. Each child was instructed to stand on a fixed spot and told that the female experimenter would walk towards her and that she would say "stop" as soon as the adult was getting "too close". Distance from the child's toes to those of the adult was recorded.

Loo examined the effects of density on five factors: verbally-abusive interaction (insults and threats), activity-toy play, avoidance, negative affect-aggression, and desire-to-leave-a-crowded room. She sums up the findings by stating that normal five-year-olds placed in a high-spatial-density condition can be expected to become more aggressive, angry, distressed, and abusive; engage in less toy play, toy changes, and physical activity; feel more crowded, have a greater desire to leave the room, interact in more abusive terms, and face the center of the room more than if they were in a low-density condition. She concluded that high density can be harmful to five-year olds, however, these results were based upon one hour of free play in an experimental setting with only the assumption that they would be maintained over a long duration of time.

With respect to individual differences in relation to density Loo found that girls in high spatial density showed reduced levels of activity and involvement with toys and increased negative feelings about the situation. For activity level, toy play, and emotional reactions, boys were affected in a similar way to girls but boys reacted less differentially

to their spatial environment than girls. While boys displayed more negative affect-aggression than girls in both density conditions, the effects of density on both sexes were nearly identical.

With respect to personal-space differences, differences between far-personal-space and close-personal-space children were found for most factors. Far-personal-space children displayed less activity-toy play, more verbally-abusive interaction and more avoidance than close-personal-space children. Far-personal-space boys displayed more negative affect-aggression than any other group. In the high-density condition, far-personal-space children showed more avoidance than close-personal-space children. Also, high density increased the verbally-abusive interaction of far-personal-space boys more than any other group. It appears that individual differences cause variation of children's behavior high density conditions.

Loo's (1978) findings support Hutt and Vaizey (1966) who also found that as density increased children tried to minimize their social encounters. They examined autistic, brain-damaged and normal children in various group-densities. They looked at 15 children in- and day- patients of a children's psychiatric hospital of ages three to eight years during free play in three group sizes. The other children in the hospital formed groups of differing sizes: small (less than six), medium (seven to eleven) and large (greater than 12). This created a high density condition of 3.7 m /child (40 ft /child), a medium density of 4.9 m /child (53 ft / child) and a low density of 7.4 m /child (80 ft /child). All groups showed significantly less social interaction with increasing group-size.

Smith and Connolly (1977) investigated the effects of crowding on

two groups of preschool children in three experiments. In all experiments they measured group play, aggressive behavior and rough-and-tumble play. In the first experiment, group size was varied over three terms. The ratio of small to large group size was approximately 2:3 in term one, 1:2 in term 2, and 1:3 in term three. The space and equipment were varied commensurately with the numbers of children in each session and then held constant for each term. There were no significant effects for either group play or aggressive behavior. There was a tendency, significant for one group, for a decrease of rough-and-tumble play in the smaller size/resources condition.

In the second experiment spatial and play equipment densities/resources were varied independently while the group size was constant at 24 children for both groups. For the densities of 2.3 m^2, 4.6 m^2 and 6.9 m^2 (25, 50 and 75 ft^2) per child there were no significant effects on group play or aggressive behavior, but there were fewer samples of rough-and-tumble play in the 2.3 m^2/child condition. A decrease in the equipment led to an increase of aggressive behavior and rough-and-tumble play (significant for only one group).

In the third experiment groups of 10 and 30 were presented spatial densities of 1.4 m^2/child (15 ft^2/child) and 5.6 m^2/child (60 ft^2/child). There were no significant effects on group play, although there was a tendency for less group play at the higher spatial density. There was more aggressive behavior at the higher density, but this finding was significant for only one group. There was much less rough-and-tumble play in the higher density condition.

The authors suggested that aggressive behavior and rough-and-tumble play were more likely to occur when there was less equipment available

per child. There appeared to be no significant effects of spatial density on group play although there was some decline as space was reduced. There were no effects on aggressive behavior within the range of 6.9 m^2/child to 2.3 m^2/child. They suggested however that the threshold effect on aggressive behavior was below this range, possible at 1.4 m^2/child, at which level in experiment three aggressive behavior increased significantly. Rough-and-tumble play remained fairly constant in the 6.9 to 2.3 m^2/child range, at 2.3 m^2 this behavior decreased and even more so at 1.4 m^2/child. It appears that reduced space acts as a behavioral constraint on gross motor activities such as running and chasing games as in rough-and-tumble play.

However in this particular study Smith and Connolly assumed that size, space and number of children is a linear relationship to the amount of play equipment needed and can be increased proportionately. They assumed that the proximity of children would remain the same as number and space increased. This study did not consider the possibility of an interaction between group size, space and amount of play equipment or how children adapt to their environment (Loo, 1972; McGrew, 1970).

Another study that examined children's social interaction in relation to spatial density was carried out by Rohe and Nuffer (1977). They investigated the behavioral effects of spatial density and the partitioning in a day care center. They examined 12 children (40 to 68 months of age) in the four experimental conditions of low density with partitioning, low density without partitioning, high density with partitioning, and high density without partitioning. The low density of 2.8 m^2/child (30.5 ft^2) was created by using a room divider. The partitioning was manipulated by either having an open play room or using eight partitions that separated

five different areas (art, puzzles, blocks, jungle gym, play kitchen). The children were exposed to a different condition each day for 25 consecutive school days. Each child was observed for a total of three minutes each day during a 45 minute free play period in the afternoon. During each minute a child's behaviors were recorded every ten seconds. The researchers examined three general categories of behavior that included social interaction (unoccupied, solitary, associative, cooperative, aggressive), individual's relationship with the environment (participating, constructing, destructing) and affect (positive and negative) behaviors. With respect to the effects of density the researchers found that in the high density condition associative and cooperative behavior, and the use of the puzzles and kitchen area decreased while the use of the jungle gym increased. It can be suggested by the results that high density may act to inhibit social interaction, which is supported by Hutt and Vaizey (1966), Loo (1972, 1976) and Shapiro (1975) who also found less social interaction in higher densities. The authors also suggested that because the use of the jungle gym requires less concentration and more gross motor behavior and because the use of this area increased with higher density, that high density might affect the ability of a child to attend to tasks with clearly defined goals.

The partitioning factor had some main effects in that cooperative behavior and the use of the kitchen area increased; aggressive behavior and the use of the puzzles area decreased. There was an interaction between density and partitioning in that the use of the puzzles area, block area, kitchen area and the time spent in constructive behavior increased. Massing (1979) also found that children preferred using a more enclosed setting as opposed to one that was more open.

Sex differences were revealed in that the girls spent less time engaged in solitary or in destructive behavior and spent more time in the kitchen area than did the boys. The boys played more with blocks, were less mobile, and spent more time with fewer activities. These findings support the results found by Shure (1963).

It appears that partitioning might have mediating effects on the density behavior relationship. Partitions might have decreased the number of interruptions which Loo (1972, 1976) found to create unstable play activities, possibly due to frustration. Partitioning might decrease the child's reception of stimulation and allow for greater concentration which then results in more goal oriented behavior.

Researchers have examined several spatial characteristics of the preschool physical environment. They have described and compared patterns of behavior as they occurred in the various settings within the natural environment and it appears that the ammount of space and number of materials available in settings influence children's behaviors. Other researchers have examined how the quality of space and changes in the settings affect the children's behavior.

Density, one factor of the environment has also been found to affect children's behavior, especially their social behavior. It appears that density less than 2.8 m^2/child (30 ft^2/child) leads to more aggression, more uninvolvement, less social interaction and more unstable and interrupted play. It seems that the more crowded conditions provide too much stimulation, creating physical and psychological constraints on the children and therefore causing fewer social interactions and less large motor activity. When the children are exposed to a lot of stimulation they are unable to attend to tasks, creating uninvolvement, unstable play

activity and more aggression.

Several density studies indicated sex differences among children in higher density conditions. Boys were seen to react more aggressively to crowded conditions whereas the girls seemed to interact less and their play became more unstable. Other individual differences were seen in that some children were better able to cope with crowded conditions than others. Some children were sensitive to others infringing on their personal space and showed their sensitivity to the crowded conditions through anger and distress.

The research done on the interaction between children and density has been done during free-play situations in either a natural or experimental setting. Children's observed behaviors in the various density conditions were recorded. Their behaviors were measured by examining various aspects of social interaction, involvement, aggression and stability of play. The researchers have implied that the physical setting influences a child's social and cognitive development.

Play

Beginning in infancy, play is a child's way of life. Play is a way for a child to understand his environment. Play assists growth and development by allowing the child to make plans, make decisions on play situations and eventually create and manipulate sequence of events.

In Piaget's cognitive developmental theory of environment-organism interchange, play is considered an important way for the child to learn about his world and as an indicator of the child's level of cognitive development (Frost & Klein, 1979). The literature on play supports the significance of play as a recognizable form of behavior (Feitelson & Ross, 1973; Freyberg, 1973; Liebermann, 1977; Piaget, 1962; Smilansky, 1968;

Singer and Singer, 1977; Sutton-Smith, 1971).

Smilansky (1968) and Freyberg (1973) showed that children who were involved in imaginative play were better skilled in verbal communication. Freyberg also found that these children were more responsive, more creative in using play materials, showed more inventiveness and originality, involved in more labelling and showed greater concentration. Liebermann (1977) found that the higher the children scored on different components of playfulness (physical spontaneity, manifest joy, sense of humor, social and cognitive spontaneity), the better they performed on divergent thinking tasks (ideational fluency, spontaneous flexibility and originality). Smilansky (1968) stated that imaginative play enables children to develop in three important areas: creativity (Dansky & Silverman, 1976), intellectual growth (power of abstraction, widening of concept and acquisition of new knowledge), and social skills (positive give and take, tolerance and consideration).

Singer & Singer (1977) stated that imaginative play makes for a happy childhood. Children engaged in make-believe games show indications of elation, happiness and contentment, they make important strides in self-development, improve their imagery and verbal skills, develop emotional awareness and sensitivity, they are more flexible in social situations and increase their ability to explore new contexts and to try out new situations in odd combinations.

Play Typologies

Researchers have been interested in children's play because of its influence on children's development. They have investigated children's play behavior by developing play typologies to describe ways in which children structure their play. The first observational studies of child-

ren's free play preferences were often centered upon the social play hierarchies defined by Parten (1932). She observed the social participation of preschool children in order to develop a better understanding of adults group habits which persist from childhood. She provided a more uniform meaning to the term "social" than had been done previously and also defined various behavior patterns in social participation among children. Since then researchers have reported significant relationships between social play behaviors, as defined by Parten, and age for preschool children. Parten proposed four categories of social play: *solitary play* where the child is engaged in independent activity apart from others; *parallel play* is when the child is playing alongside others at the same type of activity with no interaction; *associative play* is when the child engages in some minimal interaction and exchange with others but keeps independent goals; and *cooperative play* is when there is a common group goal and differentiated roles. These categories develop sequentially, are more predominant at the age at which they develop, decline as a new category develops, but remain in the child's play (Frost & Campbell, 1978). Solitary play begins to decline at three or four as associative and cooperative play increase, with cooperative play predominating by five years (Iwanaga, 1973; Rubin, 1977; Rubin, Watson & Jambor, 1978).

The maturity levels associated with solitary and parallel play were investigated by Smith (1978) who looked at preschool children's play behaviors over nine months. The children's behavior was observed and recorded for 40 ten second samples. He used the social behavior measures of solitary (including onlooker and unoccupied behavior), parallel and group (combined associative and cooperative play). He found that parallel behavior was the predominant behavior in two and three year olds, and

often preceded a period of predominantly group behavior. Most three and four year olds moved mainly from solitary to group behavior. Although solitary play decreased with age and was seen less frequently in older children, some three and four year olds showed periods of predominantly solitary behavior, alternating with predominantly group behavior. Smith concluded that solitary play can be seen as a mature coping behavior, especially for older children.

Another source of information regarding children's play behaviors evolved from Piaget's proposal for successive stages of play. Buhler proposed five categories of play and Piaget organized them into three categories according to their relationship to stages of cognitive development (Piaget, 1962, p. 109). Smilansky (1968) elaborated upon the original Piaget play categories and labelled them accordingly: *functional play* occurs when play is simple, repetitive muscular activity and occurs first and predominates during the sensori-motor period (0-2 years); *constructive play* is the manipulation of objects to construct or create something and is viewed as a transition category; *dramatic play* is when the child uses make-believe, pretending and imagining and predominates during the pre-operational period (3-7 years); *games-with-rules* is when the child's play is conducted according to socially agreed upon regulations and is the most advanced play (Frost & Campbell, 1978).

Rubin and Maioni (1975) used these cognitive levels of play and found that prekindergarten children exhibited significantly higher levels of functional and constructive play than either dramatic play or games-with-rules. This was supported by Rubin, Watson and Jambor (1978) when they found that kindergarten children displayed higher levels of dramatic play and less functional play than nursery children.

Sutton-Smith (1971) classified and studied four modes of play by

examining each category according to one of the basic theories of how one comes to understand anything or one of the basic theories of truth. He proposed four categories of play. *Exploration* occurs when the child is passive, examining things in his/her own terms. Exploration is thought to be a precursor form of causal analytic understanding. *Imitation* occurs when a child understands something by modelling a behavior. This may be a precursor for a correspondence theory truth, which means one understands something when the form that is created corresponds to reality. *Testing* is directed to "what I can do" where the child tries himself out in a variety of ways. Testing is like prediction. *Construction*, or world building, occurs when a child in his own way puts things together which are separate somewhere else. Construction is like coherence theories of truth where one establishes something only when shown how things fit in with all the other facts.

Play Studies

Researchers have used the play typologies with some modification to study play. Iwanaga (1973) examined the development of a cognitive-based typology of interpersonal play structures which are defined as the ways in which children structure their play interactions with peers. The structures differed in the ways the children assigned roles to themselves and peers, and in the ways these roles were enacted. She used the structures: independent (child included only himself), parallel (two or more children together but roles were different and independent of each other), complementary (same as parallel with an element of cooperation) and integrative (roles were assigned to self and others and enacted interactively). Iwanaga suggested that these structures appear in a sequential progression where there is a strong relationship between age

and the highest level of interpersonal structure attained: parallel at three, complimentary at four, and the integrative structure at five years. She also discovered sex differences in that the girls displayed the sequential progression mentioned above, however, the boys engaged mainly in the independent structure until five years of age and then mainly in the integrative structure.

Researchers have used children's play when determining the effects of different variables in the environment on children's behaviors. It has been found that children's play behaviors are affected by the amount of space, materials available, changes in the setting and differing spatial densities. These studies have previously been discussed in the Environmental Studies section.

Johnson (1935) looked at children's play and how it is influenced by varying the amounts of play equipment in nursery and kindergarten playgrounds. She added and withdrew equipment from three outdoor play areas. She used a time-sampling principle of observation where each child was observed once in each five-minute unit of time. On one playground she observed the children for a total of 21 times and on the other two she observed each child only 12 times. She found that when the play equipment was reduced there was less bodily exercise of play with materials and more undesirable behavior (crying, teasing and quarreling), more game playing, more social interaction and more use of permanent materials (dirt and sand). It appeared that more equipment decreased undesirable behavior but perhaps at the expense of social development. However, it must also be considered that Johnson not only decreased the amount of equipment but she also changed the type of equipment which may have had an effect on the children's behavior.

Frost and Campbell (1978) examined seven year old children's play behaviors on creative and traditional playground. The authors used a point-time sampling procedure where each child was observed for 10 seconds and then scored for both a social and cognitive play category. The creative playground showed a higher incidence of associative, cooperative, constructive and dramatic play. They also observed age and sex differences in the play behaviors. The boys played on the boat and playhouse climbing structure on the creative playground which resulted in a great deal of highly active, rough and tumble play. The girls were involved in more functional-parallel play as they were observed mainly on the climbing structures. The authors reported that it was difficult to distinguish between associative and cooperative play and that a possible combination of the two (group play) might be more reliable. This was also suggested by Rubin (1977) when discussing social play categories.

Other researchers have used both Parten's social categories and Piaget-Smilansky's cognitive categories when investigating the effects of different factors on children's play. Rubin, Maioni and Hornung (1976) examined socioeconomic status (middle and low) and the free play of 40 four year old children. Each child was observed for 30 one-minute time samples. The observers noted the number of seconds each child engaged in a particular form of cognitive play within each social play category. Solitary, parallel, associative and cooperative play were each divided into functional, constructive and dramatic play. They found that males displayed significantly more solitary-functional and associative-dramatic play, and significantly less solitary-constructive and parallel-constructive play than the females.

Rubin, Watson and Jambor (1978) reported that preschool children engaged in sensorimotor play while kindergarten children demonstrated more

concrete (dramatic) operational behavior. This study showed, as did Shure's (1963) that girls engaged more in art activities and boys more often played with blocks and vehicles. It also revealed that some activities (painting, crayoning, playdough, sand, water and puzzles) appeared to promote more solitary and parallel play rather than cooperative play. It appeared that the activities a teacher provided for the children might limit or encourage various social and cognitive levels of play.

Rubin et al. (1978) also utilized the Piaget-Smilansky cognitive categories nested within Parten's social categories. However, due to the difficulty of distinguishing associative from cooperative play, also discussed by Frost and Campbell (1978), these two social categories were combined to form group play. The authors also re-examined Parten's social play categories by suggesting that solitary play did not represent the least mature level of all play behaviors. When social-cognitive play was considered, solitary play became cognitively more mature with age. Rubin (1977) suggested that children who play by themselves might choose to do so whereas children who played parallel to others might want to play with others but might not yet have developed the skills to do so.

Rubin and Seibel (1979) examined the behavioral effects of the ten most preferred free play activities in a preschool setting and also the stability of social and cognitive play elicited by specific activities over three months. They observed 18 middle-class children (mean age of 49.08 months) during free play each day for two three-week periods, three months apart. Each child was observed twice for 15 one-minute time samples and the behavior (cognitive within a social category) was noted along with the duration of time. The ten most preferred activities were vehicles, playdough, painting, art construction, houseplay, puzzles, sand

and water play, blocks, numbers and letters, and "science". Other than construction toys replacing science the preferred activities remained the same (however, not in the same order) over the three months. The duration of time the children played with puzzles and playdough significantly decreased from Time 1 to Time 2. There was a significant increase in play in construction toys. However, authors reported that the changes may have been the result of a major modification in the physical layout of the preschool setting between the two periods. With the exception of vehicles and blocks, there was no change in play over time in the preferred modes of play.

The researchers reported the preferred social and cognitive modes of play for each of the preferred toys and activities and it appears that the degree of "freedom" is somewhat determined by the materials available to children. Group and dramatic play may be inhibited by the availability of art activities.

Sex differences were found in that males engaged in significantly more vehicle and sand and water play, and less painting and art construction than the females. This supports earlier findings that males engage in more parallel-dramatic play and in less parallel-constructive play than females (Rubin, Maioni & Hornung, 1976; Rubin, Watson & Jambor, 1978). It appeared that toys and materials available in a preschool setting influenced children's play behaviors.

Summary

For some time now researchers have examined several variables and their effect on children's play behavior. More recently researchers have been more concerned with how these same variables affect not only social behaviors but also children's cognitive behaviors. It has been found that

all levels of social play occur at all levels of development and it is the cognitive aspect of social play that determines the maturity of social play.

Researchers have shown that many variables influence children's play behaviors. Studies have found that there is a high relationship between children's age and their frequency of occurence of level of play. The older the children are the higher the occurrence of the theoretically higher levels of social and cognitive play. These studies have also found sex differences in the way children play. The females have been observed to be more frequently involved in activities or with materials which lead to parallel and constructive play. The males are seen more frequently involved in activities or materials which lead to cooperative and dramatic play.

Children's play behaviors have been observed to be influenced by environmental factors. Space, one of the characteristics of an environment, has been found to affect children's play. Changes in the space, size of and the materials in the setting and also the spatial density of an environment have shown to affect children's play and their development.

There are many variables within an environment which affect children's play. The amount and type of equipment affects their play. It appears that the less equipment available, the more children engage in social interaction. It has also been noted that the more creative the playgrounds, the higher the incidence of social and cognitive play.

Researchers have developed play typologies to describe how children structure their play. These typologies are based on Parten's (1932) social play hierarchy and the Paiget-Smilansky (1968) cognitive play categories. Using these typologies, researchers have studied children's play by

observing them in either experimental or natural environments during free-choice play.

Child Scan Technique

The child scan technique of observing and recording children's behaviors was developed from the point-time sampling technique used in a number of studies (Frost & Campbell, 1978; Rohe & Nuffer, 1977; Rubin & Seibel, 1979; Smith, 1978). This point-time sampling technique was used successfully to observe a child for a specific time (usually in seconds or one minute) and then the behavior was recorded. Children were observed by trained observers and reliability was determined by simultaneous data collection by two or more observers. Reliability in these studies range from an average of 81.3% (Frost & Campbell, 1978) to 95% (Rubin, Maioni & Hornung, 1976) across all categories. However, these researchers have also found that reliability in describing social play appears to be the more difficult to obtain, mainly due to the difficulty in distinguishing between the categories of group play (Frost & Campbell, 1978; Rubin, Maioni & Hornung, 1976; Rubin, Watson & Jambor, 1978).

This chapter has examined the theoretical background of the human-environment relationship and also the theoretical aspect of play. This was followed by a review of the literature on environmental influences and other variables that influence children's play behaviors. The methodology and play categories used in studying child's play were also discussed. The next chapter will describe the methodology of the present study.

CHAPTER THREE:

Methodology

In this chapter the design of this study is discussed, followed by a description of the setting and the children used for the research. The instrumentation, reliability, data collection procedures and analysis are also described in this chapter.

Research Design

The design of this study is of the pre-treatment, treatment, post-treatment type with a control group for purposes of comparing outcomes. Data were collected on the children in three rooms in a day care center. In two of the rooms the space was changed to determine the effects of spatial density on children's play behaviors. In the third room the space was left unchanged.

The five independent variables examined were room (Room A, B and C), time (morning and afternoon), age (younger than 4.5 years and older than 4.5 years), sex (male and female) and spatial density (low, high and low-returned). The dependent variable measured was the percentage of time each child spent in the social and non-play categories and cognitive play categories. Social play categories consisted of solitary play, parallel play and coordinated play. Cognitive play categories included exploratory/functional, constructive, imitative/dramatic and testing/contesting. The non-play category included routine and other types of non-play behavior. The definitions of the play and non-play categories were discussed in Chapter One.

The Setting

This study was conducted in a non-profit, public day care center.

This center was originally chosen for a broader research project (Glengarry Project, 1980) which was a follow-up to an exploratory study conducted by Massing (1979). This center was originally chosen because it contained four playrooms that were almost identical in area, shape, group size (approximately 20 children in each room), amount of equipment and staff with similar early childhood training and experiences. Furthermore, the playrooms were organized in family-aged groupings allowing for age comparisons.

Each room had three staff members: the supervising teacher, another full-time adult, and a part-time adult. During data collection one to three adults were present in the room at any time. The staff/child ratio varied from 1:20 to 3:20. All but one supervisor (Room B) had been at the center for several years.

The researchers used two experimental groups (Room A and B) and one control group (Room C). These three rooms were chosen because the supervising teacher in each room would be present for the duration of the study. The fourth room was not a possible choice because the supervisor was to be away for a portion of the study. The two experimental groups were selected after discussion with the center's director on the basis of staff willingness to permit the space variation.

Each room was divided into smaller areas or settings by furniture and equipment (see Figures 1, 2, and 3). Each room had basically the same amount of equipment and materials. However, each room's arrangement varied slightly. Each supervising teacher agreed to keep the arrangement of furniture and equipment stable throughout the study.

Each room's dimensions, area, covered and uncovered space and the maximum density (in uncovered space) in the low and high density conditions are described in Table 1.

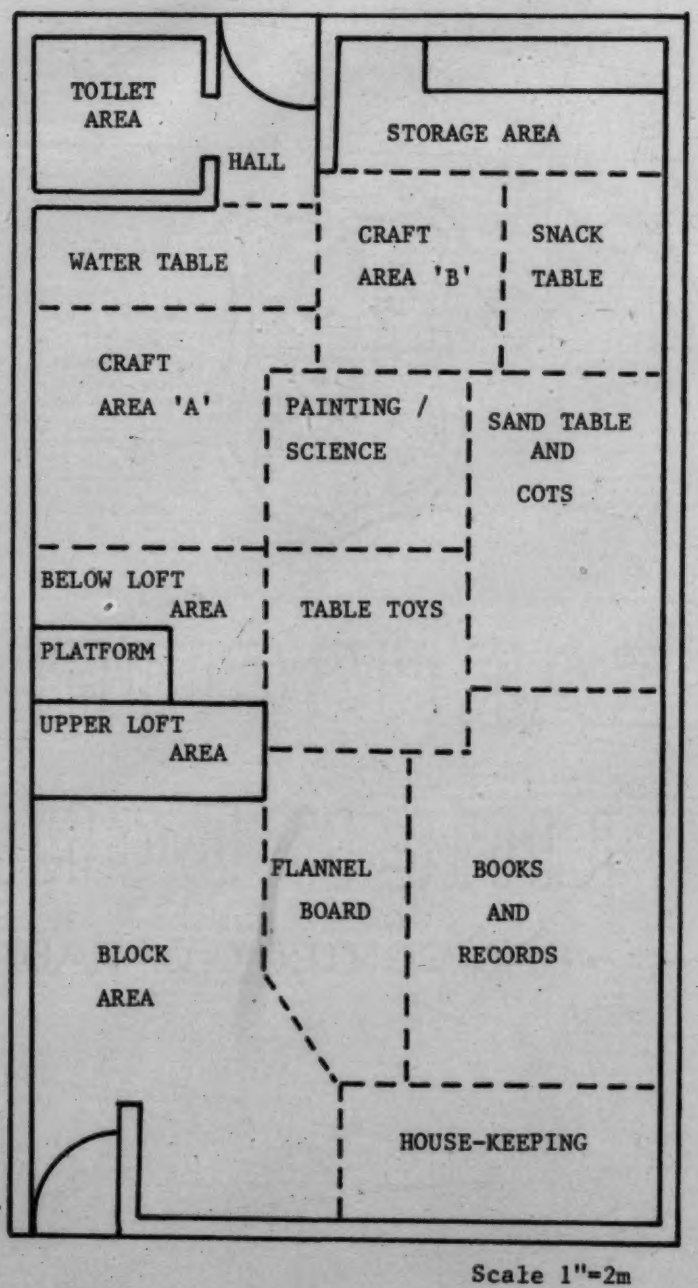

Figure 1. Room 'A' in the low density condition.

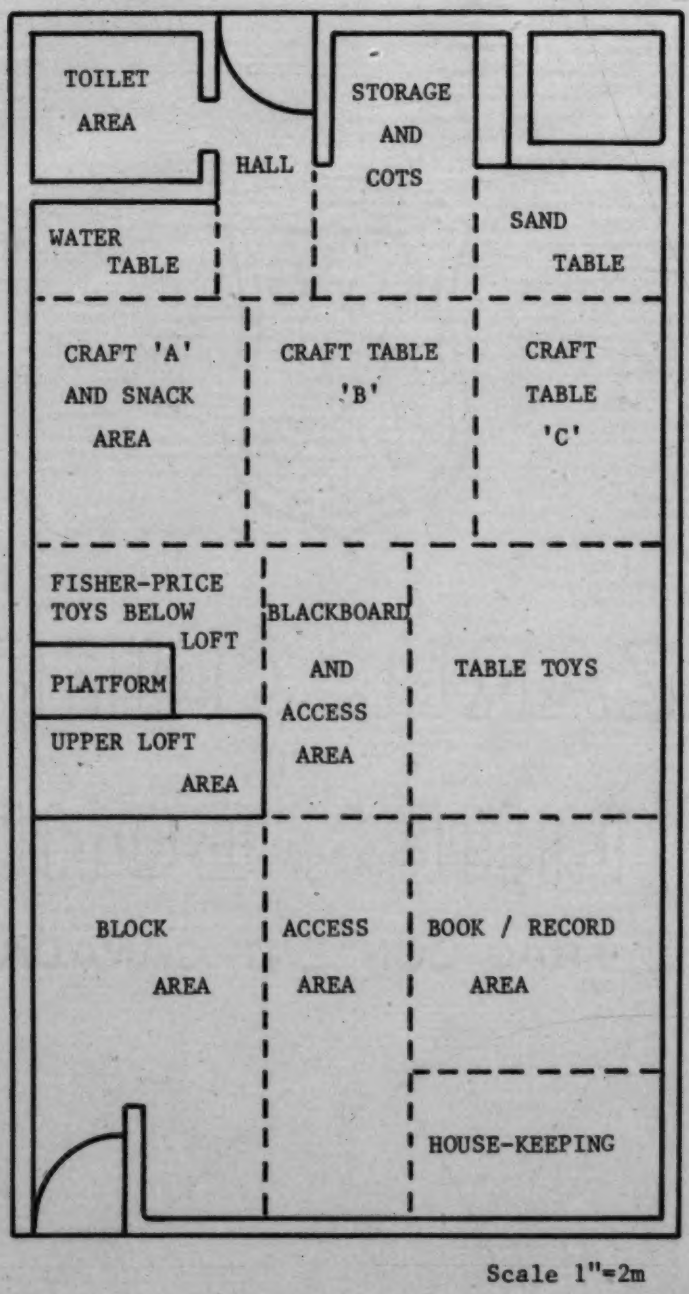

Figure 2. Room 'B' in the low density condition.

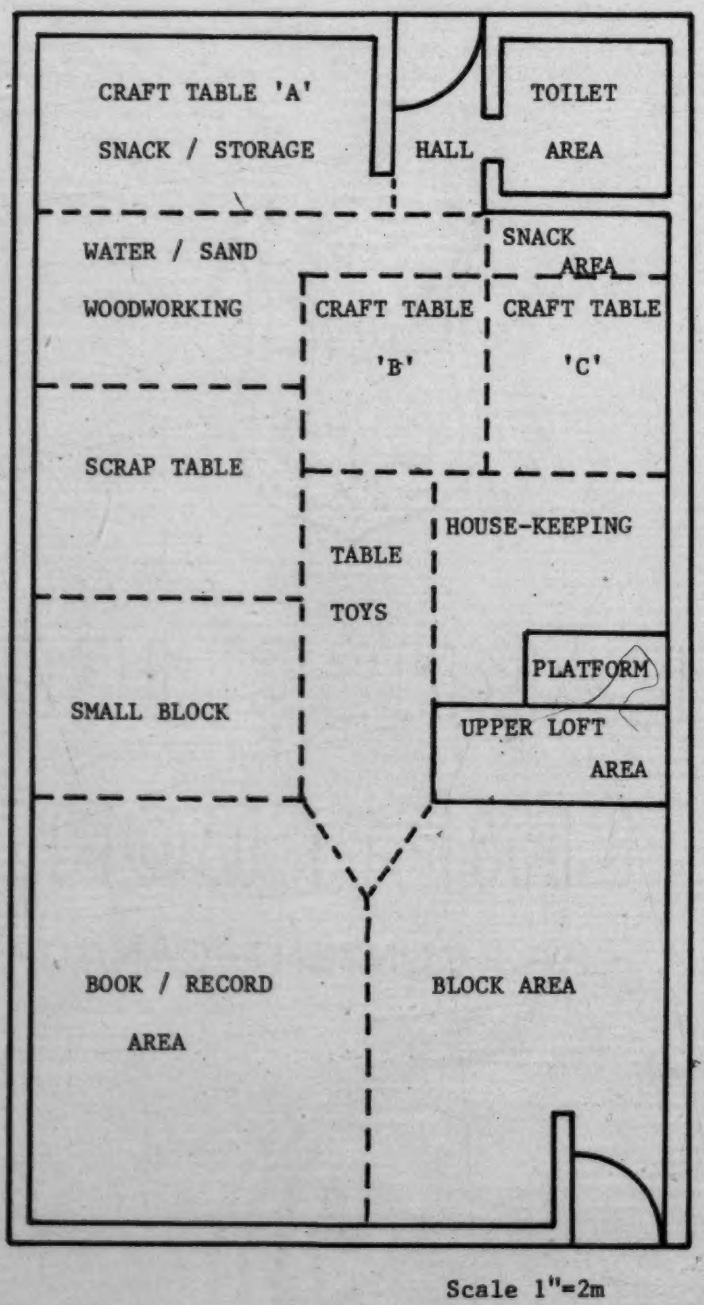

Figure 3. Room 'C' in the low density condition.

In order to achieve a higher density condition the space in Room A and B was decreased by using room dividers to block off one end of the room. An opening was left for the children to exit outside, as required by fire regulations. The children were not allowed to use the empty space during the three weeks of the high density condition.

Table 1

Spatial Descriptions of Rooms in the Low and High Density (in Meters)

	ROOM A		ROOM B		ROOM C
Density Condition	Low	High	Low	High	Low
Dimensions (m)	1.3 x 7.2	8.8 x 7.2	13.6 x 7.2	9.1 x 7.2	13.6 x 7.2
Area (m^2)	97.9	63.4	97.9	65.5	97.9
Covered Space(m^2)	10.3	9.1	12.2	11.0	11.9
Uncovered Space(m^2)	87.6	54.3	85.7	54.5	86.0
Density - m^2/child	4.38	2.7	4.29	2.7	4.3
ft^2/child	47.1	29.1	46.2	29.1	46.3
Space deleted (m^2)		34.5		32.4	

The low density of the three rooms was approximately 4.3 m^2/child. The decreased space in Rooms A and B allowed for a maximum density of 2.7 m^2/child. This high density remained with the provincial regulations of 2.5 m^2/child and was also less than the 3.25 m^2/child recommended as minimum optimal ratio by the Child Welfare League of America (1973).

During this portion of the study the configuration of the settings and location of the settings remained as similar as possible to that of the low density (see Figures 4 and 5). In order to retain the

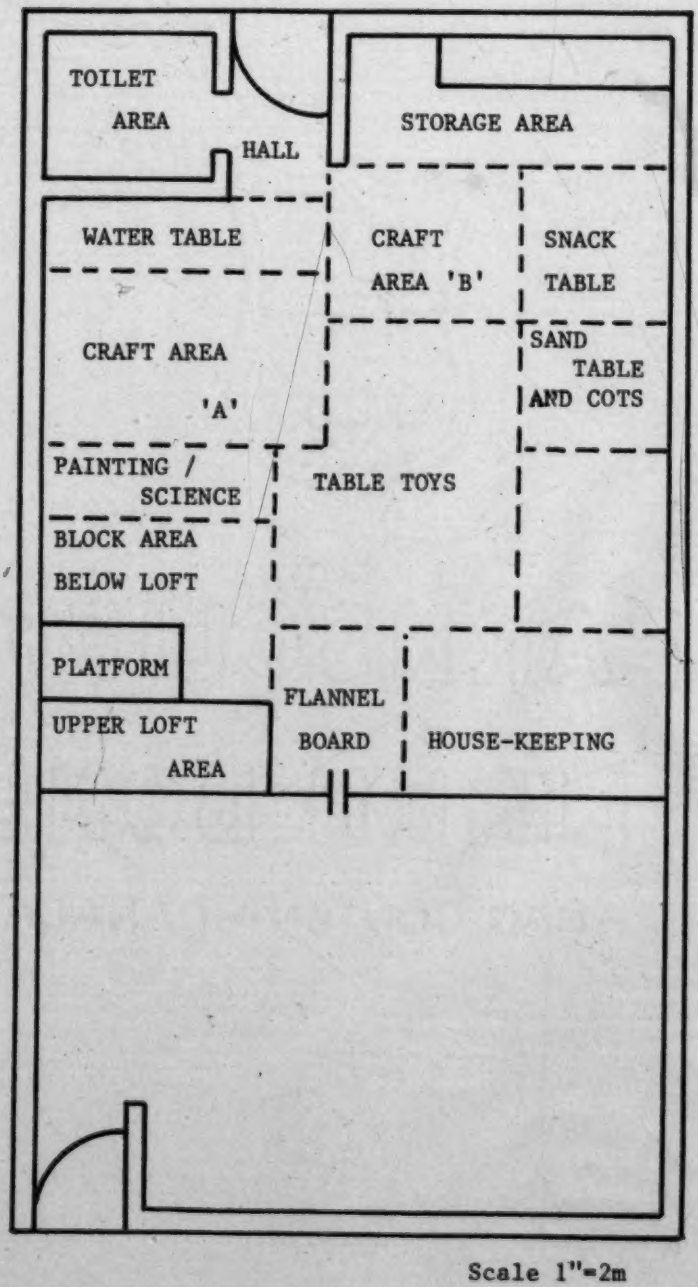

Figure 4. Room 'A' in the high density condition.

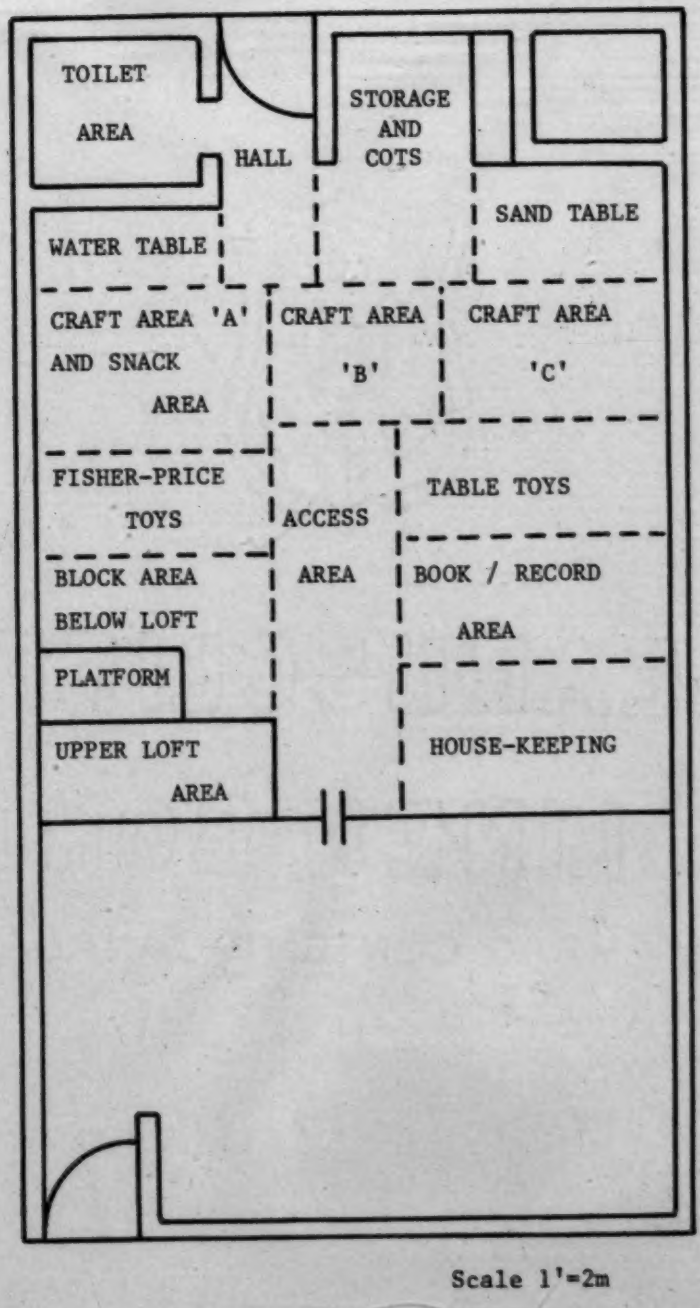

Figure 5. Room 'B' in the high density condition.

organizational structure the blocks were placed under the loft. In Room A the amount of equipment and resources were unchanged.

In Room B the access/chalkboard area was deleted and the chalkboard was removed from the room. The plastic interlocking blocks were removed from the block area. The Fisher-Price toys that were under-the-loft area were taken out and placed outside of this area. The tables in the table toys area and in the playdough area were replaced with smaller ones. These changes were made upon the request of the supervising teacher. It was felt that the decreased space had become too crowded with the amount of equipment in the room.

The children in the third room were observed in social, cognitive play and non-play over the same experimental time period. This group served to indicate in any changes in the percentage of time spent in the social play, cognitive play and non-play can be expected over a similar time period.

The Children

A total of 59 children were enrolled in the three rooms used for the study. However due to low child attendance the data on some of the children were deleted. Data for the children who were absent for more than 67% of the 264 scans in the two experimental rooms or 132 scans in the control room were deleted. Data for 15 children were eliminated for this reason and data were used for 44 children (21 females, 23 males; mean age of 4.5 years). The number of children in each room and the age range is described in Table Two.

Prior to data collection information regarding the study was sent to the parents or guardians of the children. Parents had been required to give approval for research when the children were first registered in the

center.

The study was conducted from February 11, 1980 to March 26, 1980. This period of time was expected to provide stable conditions in respect to staff and children's attendance based on records of previous years. Also at this time of the year the staff could be expected to spend the required amount of free-choice play time indoors.

Table 2

Number and Age of Children

	OLDER		YOUNGER		TOTAL	
	Registered	Subjects	Registered	Subjects	Registered	Subjects
Males						
Room A	6	5	4	4	10	9
Room B	5	2	7	5	12	7
Room C	4	4	4	3	8	7
TOTAL	15	11	15	12	30	23
Females						
Room A	5	3	5	4	10	7
Room B	5	3	3	2	8	5
Room C	6	6	5	3	11	9
TOTAL	16	12	13	9	29	21
				TOTAL	59	44

The Program

Each room at the center followed similar daily routines. The center opened at 7:30 a.m. and most children were there by 8:45 a.m. From the time the children arrived to approximately 10:00 a.m. the children were

involved in free-choice play, with access to all the settings. Craft activities were set out and avilable to the children. During this free-choice play period a mid-morning snack was made available to the children. The children came independently to sit at a specific table in a small group for this activity.

During the study the teachers were asked to maintain their normal behavior. They interacted with the children in a variety of ways. They sometimes became involved in the children's play by reading a story to small groups of children, assisting at the craft areas, being part of the imitative/dramatic play, supervising and intervening.

After free-choice play period the children went outdoors to a play area for about one hour, then returned for a story or group activity just before lunch. Following lunch the children rested until 2:00 p.m., followed by one hour free-choice play period, which included a mid-afternoon snack. The children went outdoors again after this. When the children returned from outdoors, they played in free play or group activities until they were picked up by their parents.

Behavior Recording Procedures

Data were collected by ten observers who used a point-time sampling technique based on a coding form, the Child Scan Recording Sheet (see Appendix A). This recording sheet was developed for use in the larger research project (Glengarry Project, 1980). Each child was observed in succession for a ten second interval and then coded for setting, behavior, activity and if appropriate, a social and cognitive play category. Only the information for the non-play, social and cognitive categories was used for this thesis. The social play categories were adapted from Parten (1932); the cognitive play categories were developed by integrating the Piaget-Smilansky (1968) and Sutton-Smith (1971) modes of play (see Chapter

one and Appendix A).

The children's names were arranged originally in random order and the observers began with a different child each day. The observers coded each child in each room four times within one free-choice play period or once each 15 minute time segment. Each observer was equipped with a portable tape recorder and an earphone which emitted a beep every ten second. The observer located the child, watched for ten seconds and then coded the child using the Child Scan Recording Sheet. Where more than one category of social or cognitive play occurred simultaneously, e.g. constructive and imitative/dramatic, the theoretically higher category was coded.

Observer Training

Prior to data collection each observer was involved for a minimum of 10 hours of training to a reliability level of at least .80 across all coding categories. The first three training sessions were group seminars using slides and a video-tape of children playing. The remaining sessions used the actual rooms and children involved in the study. The observers were then able to become familiar with the children and the room and also the children became accustomed to the observers and the observation procedures. Most observers were assigned to collect data in just one room creating teams of two or three for each room. Two observers were used in all three rooms as criterion observers for determing reliability and in case any observer was unable to code. Only one observer was present in the room at any one time except during reliability checks.

Interobserver Reliability

Observers within each room were paired systematically to collect data simultaneously to determine reliability within the rooms. Reliability pairings were made at intervals throughout the course of data collection

and reliability was calculated on 12% or more of the child scans in each room. The formula used for calculating interobserver reliability was as follows (McGrew, 1972):

$$\frac{\text{no. seen by both A and B}}{\text{(no. seen by both A \& B) + (no. seen by only A) + (no. seen by only B)}}$$

where no. = number of observations, and A and B are two independent observers.

The level of agreement was calculated for non-play categories, social play categories and cognitive play categories. The level of agreement for non-play categories was .92, for social play categories was .75, and for the cognitive play categories was .85. The reliability remained consistent throughout the study.

Data Collection

The child scan data were collected in the two experimental rooms during free-choice periods in the morning and afternoon for 33 consecutive days. Free-choice period occurred the same hour every morning (8:45-9:45) and afternoon (2:15-3:15). Total possible observations for each child were 264 observations. These two rooms were observed in the low density condition for 10 days. The space was decreased and data were collected in the high density condition for 15 days. It was originally planned to collect data in the high density condition for only ten days, equivalent to the low density condition. However, due to a high rate of child absenteeism and therefore a lower density, data collection was extended to include another five days. A criterion density of 4.5 square meters per child was chosen to avoid any overlap of densities in the high and low density conditions. Data for the days in the high density condition where the density exceeded this criterion were eliminated prior to the data analysis. Data for 12 mornings and afternoons were used for Room A and

data for eight mornings and 11 afternoons were used for Room B. The number of children changed between morning and afternoon because the children arrived at different times during the morning. The range of densities in each room is described in Table Three.

After 15 days the space in the two experimental rooms was returned to its original size and data were collected for another eight days.

Table 3

Range of Densities in Each Room over the Three Experimental Time Periods

	Time Period	Room A		Room B		Room C	
		Range	X	Range	X	Range	X
Morning Density*	1	4.7 - 5.8	5.3	5.1 - 8.2	6.2	4.9 - 7.3	5.6
	2	2.9 - 4.4	3.5	3.0 - 4.3	3.8	5.1 - 6.0	5.5
	3	5.3 - 5.8	5.5	4.5 - 6.6	5.3	5.2 - 5.7	5.3
Afternoon Density*	1	4.6 - 5.7	5.2	4.5 - 8.6	5.7	4.8 - 5.9	5.4
	2	2.9 - 4.2	3.3	2.9 - 4.3	3.7	4.7 - 5.7	5.0
	3	4.6 - 5.3	5.1	5.6 - 6.6	6.0	4.5 - 5.2	4.9

*Density is expressed as the average of the ratios of square meters to children present. The range is given across the days of data collection used in calculating children's scores.

Data in the control room were collected every second day for a total of 16 days, ie. 128 observations per child. Data in the control room were not collected every day due to a shortage of trained observers and because conditions in the control room did not change. The amount of data collected in the regular density condition in this room over the total time was the equivalent of the amount of data collected in the

regular density condition in this room over the total time was the equivalent of the amount of data collected in the regular density condition in the experimental rooms.

Data Analysis

The data collected for this study consisted of 656 child scan observations, which represented four child scans each morning and each afternoon in three rooms over thirty-three days. Some of the data (72 child scans) were deleted due to absenteeism on certain days in time period 2 and therefore only 584 child scans were used for data analysis.

Owing to the large number of variables to be considered for analysis (i.e. room, time, age and sex), with a fairly small sample size (i.e. 16, 12 and 16), it was not feasible to use confirmatory statistics on the data analysis (Keppel, 1973). Instead, the data was analysed by the exploratory technique (Tukey, 1977, 1980). The exploratory data analysis was used to make broad general inquiries about the data in order to develop important questions for further extensive research.

The child scan data used for analysis were processed to provide the frequency scores for each child in each social and cognitive play or non-play category. The data were then reduced to the percentage of total time each child spent in the play or non-play categories in each of the three experimental time periods. Percentages were calculated on the number of scans for which the child was observed. The mean percentage of time spent in play and non-play behavior by the children in the low and high density conditions were subsequently compared for the children in each room. The scores were organized into tables showing the group mean percentage scores for the children within each room in each of the three spatial density conditions for morning and afternoon. The data were also organized by age

and sex grouping for each room.

The spatial density was manipulated in Rooms A and B but remained constant in Room C over the three experimental time periods. The mean percentage of time in play and non-play behavior of the children in Room C was used to determine how much variation in the percentages might be considered normal over the three experimental time periods. The variations in play and non-play mean percentages for Rooms A and B, were considered important to report *only* if they exceeded the variations reported for Room C over the three time periods. For example, if the mean percentage score for solitary play in Room C changed from 14% to 16% over the three experimental rime periods (a variation of +2%), then the mean percentage of time spent in solitary play in Rooms A and B was only reported if this mean percentage exceeded a 2% change between any of the three time periods.

Within the percentage data were three factors which had to be considered: 1) changes in percentages over the three experimental time periods within all three rooms; 2) different ranges of the percentages dependent upon room; 3) different sample sizes dependent upon room.

Summary

The study was designed to examine children's behavior during changes in the spatial characteristics of a day care environment. The study investigated the effects of spatial density on children's social, cognitive and non-play behaviors. The child scan technique was used to measure the play behaviors of 44 children in two experimental rooms and a control room. The data collection period extended over thirty-three days during which the children in the two experimental rooms were exposed to two spatial densities. Data were collected by trained observers and reliability was checked throughout the study. Child scan data were

processed to show percentage of time spent in the play and non-play categories. Findings were compared for room, time, age, and sex. The findings from the data analysis are presented and discussed in the following chapter.

CHAPTER FOUR:

RESULTS

In this chapter, data are presented in three sections which correspond to the research questions outlined in Chapter One. In the first section, data which relate to the effect of spatial density on the children's social play and non-play behaviors are presented. The non-play behaviors will be discussed with social play behaviors in order to present a complete picture of the children's total use of time. The second section contains the data which relate to the effect of spatial density on the children's cognitive play behaviors. The final section contains data which relate to the subsequent effect of a high density condition on the children's play in the return to a low density condition. Within each section other variables to be examined will be the effect of room, time (morning or afternoon), age and sex on the children's play behaviors.

The experimental period was divided into three time periods. Rooms A and B were subjected to the low density, high density and low density returned conditions. Over the same three time periods Room C remained continuously in the low density condition. These three time periods will be referred to as time period 1, time period 2, and time period 3 for convenience in discussion. In the first two sections the mean percentage of time spent in play and non-play in the low and high density conditions are compared. For the last section, the mean percentages in the low and high density conditions are compared.

Social Play Categories

Question 1: What differences occurred between scores for children during two different spatial densities for the social categories of play:

(a) solitary play

(b) parallel play

(c) coordinated play

(d) non-play

The social play categories consisted of solitary play (S), parallel play *with no* language (P^-), parallel play *with* language (P^+), and coordinated play (C). The non-play (NP) categories were either other (O) or routine (R). The mean percentages of the children's scores in Rooms A and B in the two spatial density conditions (time periods 1, 2 and 3) are presented in Table 4 and illustrated in Figures 6, 7 and 8.

Generally, the scores for Rooms A and B for the social play categories did not show a greater variation between the experimental high density condition and the regular low density condition than those variations found in the control room over the three time periods. However, Room B showed a greater variation in the time spent in solitary play and also in routine non-play in the high density condition (see Figures 6 and 8). The variation of 3.8% in solitary play and the variation of 3.7% in the routine non-play were greater than the variations seen in these categories for the control room. This increase of time spent in solitary play and non-play resulted in a decrease of time spent in the two parallel play categories. However, this decrease of time in the two parallel play categories was not greater than any variations seen in the control room in the same two categories.

Room A showed a slight decrease of time spent in parallel play with language and a slight increase in routine non-play behaviors in the experimental high density condition (see figures 7 and 8). The variation of 4.6% in parallel play with language and the 1.7% variation in routine

Table 4

Mean Percentage Scores for Social Play and Non-play within each Room over Three Time Periods*

Time Periods	Social Play Category	ROOM A N = 16	ROOM B N = 12	ROOM C N = 16
1		15.3	11.2	11.7
2	S	14.1	15.0	13.6
3		15.3	15.3	12.8
1		7.5	11.9	15.7
2	P	10.9	8.4	11.4
3		12.5	9.8	13.6
1		22.9	23.0	21.7
2	P+	18.3	19.4	22.4
3		19.5	22.8	25.6
1		19.3	24.2	23.1
2	C	19.1	25.5	23.6
3		20.8	25.4	19.2
1		17.9	18.3	15.6
2	O	18.8	17.4	16.4
3		15.9	14.8	15.4
1		12.1	8.5	11.1
2	R	13.8	12.2	10.9
3		9.4	10.1	12.0

*Due to Computer truncation the percentages do not exactly total to 100.

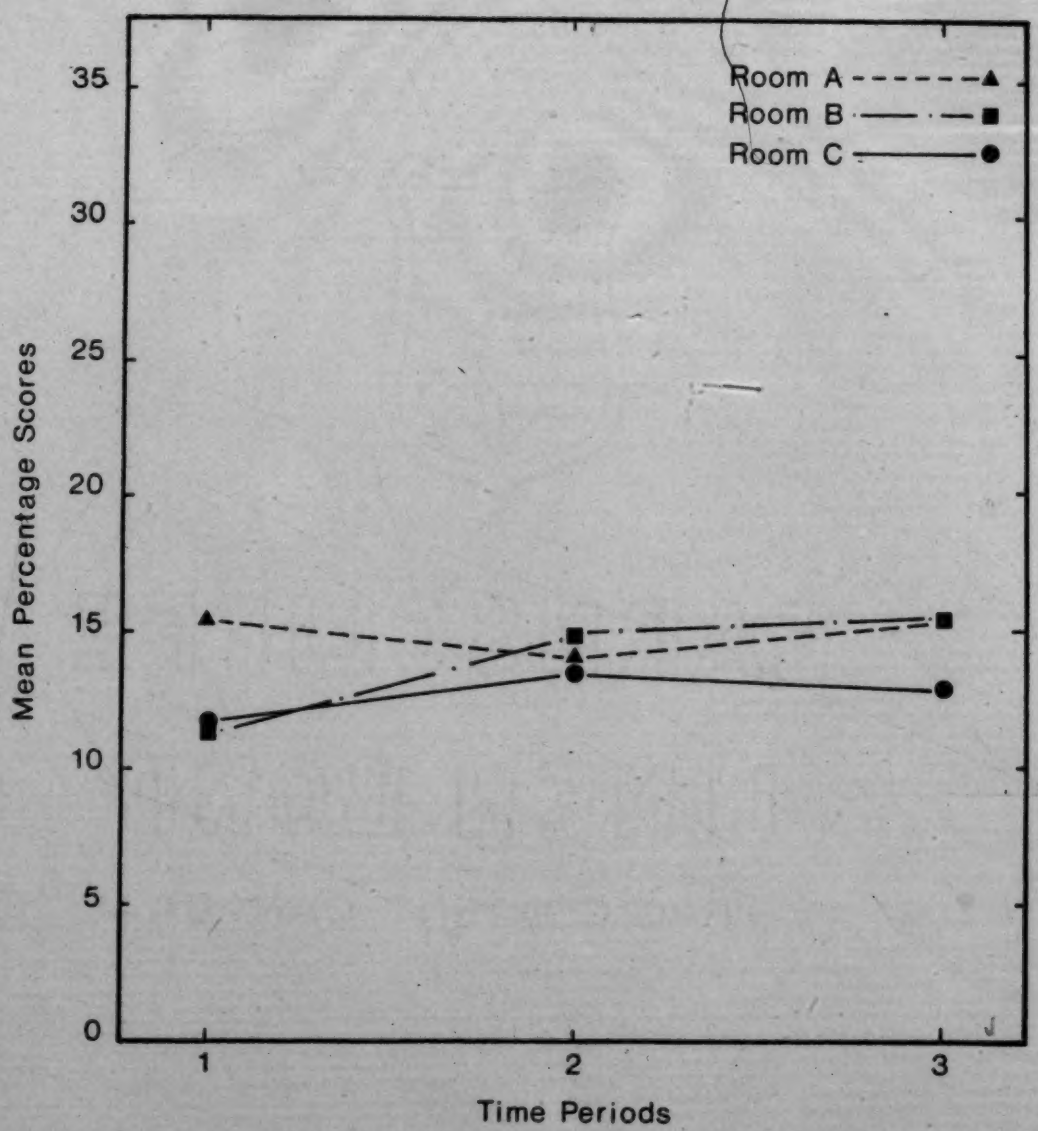

Figure 6. Mean percentage scores for solitary play Rooms A, B and C over three time periods.

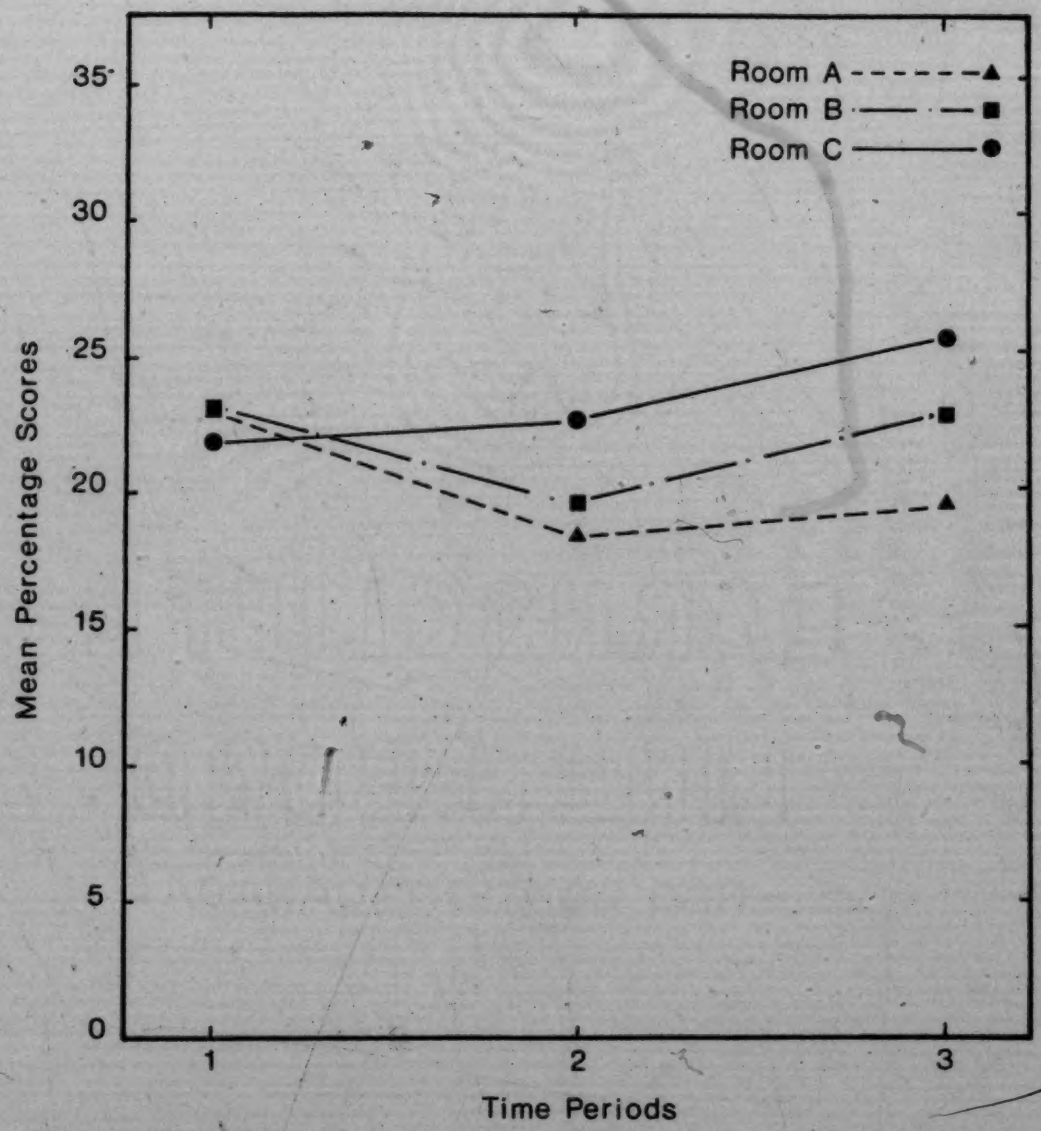

Figure 7. Mean percentage scores for parallel play with language for Rooms A, B and C over three time periods.

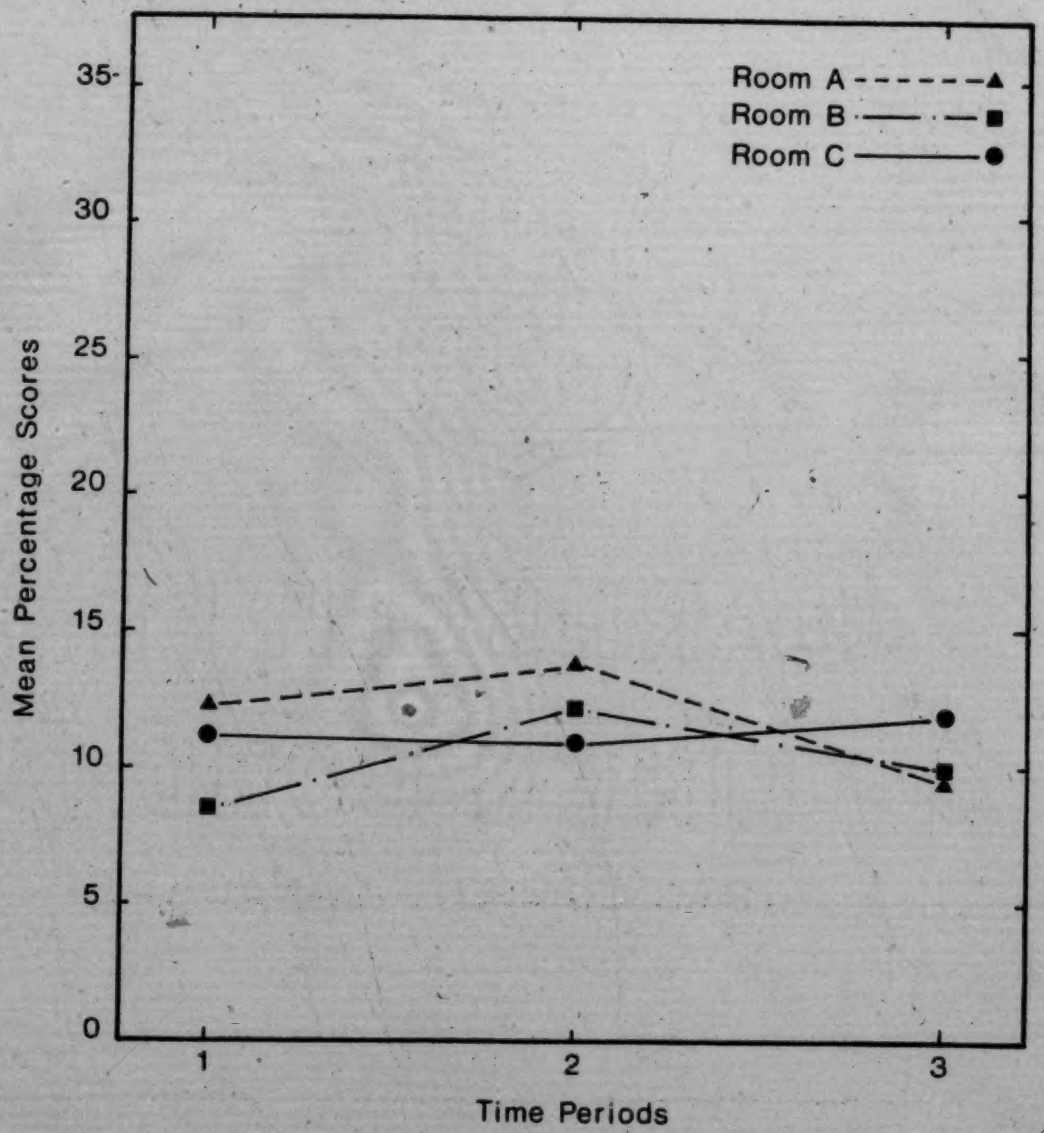

Figure 8. Mean percentage scores for routine non-play for Rooms A, B and C over three time periods.

non-play are just slightly greater than the variations seen in the control room in the same two categories. The percentage of time spent in parallel play with language in both Rooms A and B decreased in the high density condition and then increased again in the low density returned condition. Whereas in Room C the time spent in parallel play with language increased over the three time periods (see Figure 7).

Another factor that was considered in the effect of space change on children's behaviors was the time of day. The mean percentages of time spent in play and non-play within each room for morning and afternoon are presented in Table 5 and illustrated in Figures 9, 10 and 11. The scores for the percentage of play in the high density condition in the morning and afternoon remained fairly constant despite the changes in the amount of floor space. However, Room B showed a greater increase of time spent in solitary play in the afternoon during the high density condition than during the regular low density condition (see Figure 9). This 4.1% variation in solitary play was greater than the variation seen in the control room for solitary play over the three time periods in the afternoon. Room B also exhibited some differences regarding non-play behaviors in the morning and afternoon during the high density condition (see Figures 10 and 11). The children in Room B spent 3.3% less time in non-play in the morning during the high density condition and 9% more time in non-play in the afternoon during the high density condition than during the low density condition. Both these variations were greater than the variations seen in Room C for the morning and afternoon over the three time periods. The increase in time spent in solitary play and non-play in the afternoon during the high density condition resulted in a decrease of time spent in parallel play but again these variations were not greater than the variations seen in Room C.

Room A showed a greater increase of time spent in non-play in the morning during the high density condition than for the morning in the regular low

Table 5

Mean Percentage Scores for Social Play and Non-play

Within Each Room for Morning and Afternoon Over Three Time Periods

		MORNING			AFTERNOON		
	Social	ROOM			ROOM		
Time	Play	A	B	C	A	B	C
Period	Category	N = 16	N = 12	N = 16	N = 16	N = 12	N = 16
1		15.4	11.4	10.0	15.2	10.9	13.3
2	S	13.3	15.0	13.8	14.9	15.0	13.4
3		15.9	15.3	13.7	14.7	15.3	11.8
1		6.9	12.5	7.2	8.1	11.3	24.2
2	P^-	7.9	8.8	9.6	13.8	7.9	13.1
3		11.1	8.7	12.9	13.9	10.8	14.3
1		20.4	18.3	28.4	25.4	27.6	15.0
2	P^+	18.8	20.0	19.5	17.8	18.8	25.4
3		13.6	19.1	19.2	25.4	26.3	32.0
1		22.7	26.0	26.1	15.9	22.4	20.1
2	C	21.7	27.3	29.8	16.4	23.6	17.4
3		24.1	28.1	27.9	17.4	22.7	10.5
1		29.9	29.0	28.4	30.0	24.4	24.9
2	NP	33.5	25.7	26.5	31.1	33.4	28.0
3		24.8	25.8	26.8	25.6	24.0	28.8

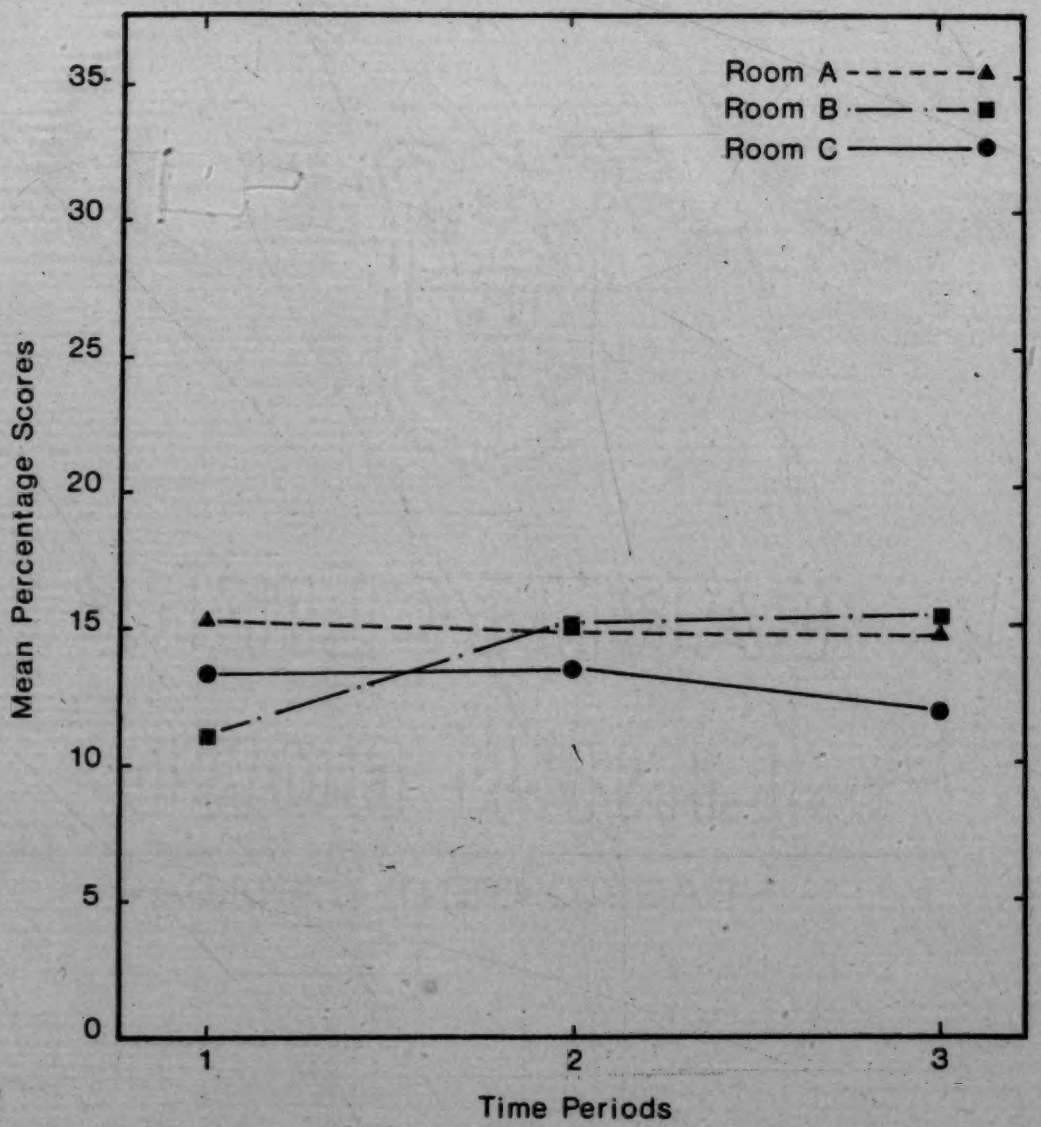

Figure 9. Mean percentage scores for solitary play for Rooms A, B and C in the afternoon over three time periods.

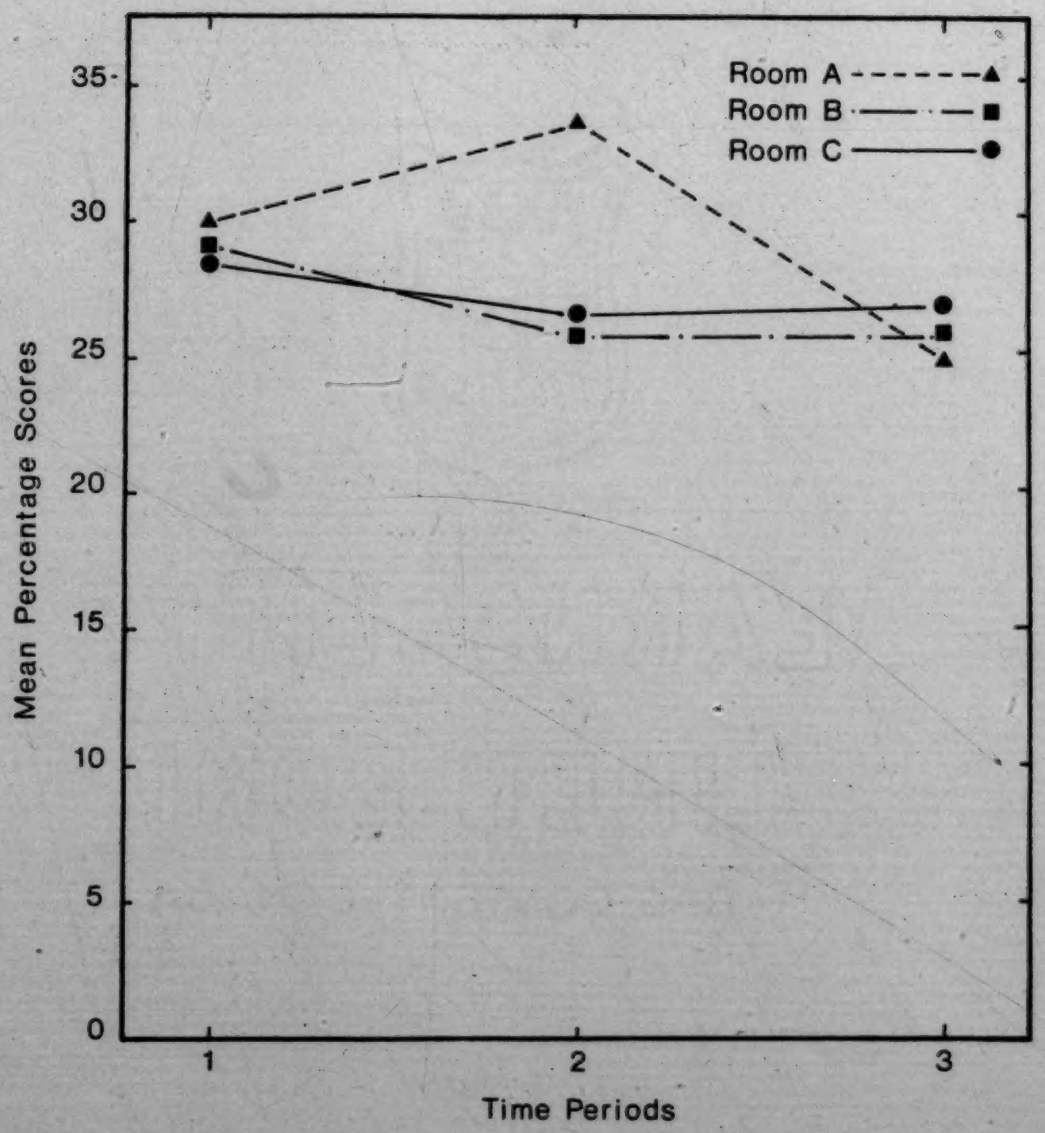

Figure 10. Mean percentage scores for non-play for Rooms A, B and C in the morning over three time periods.

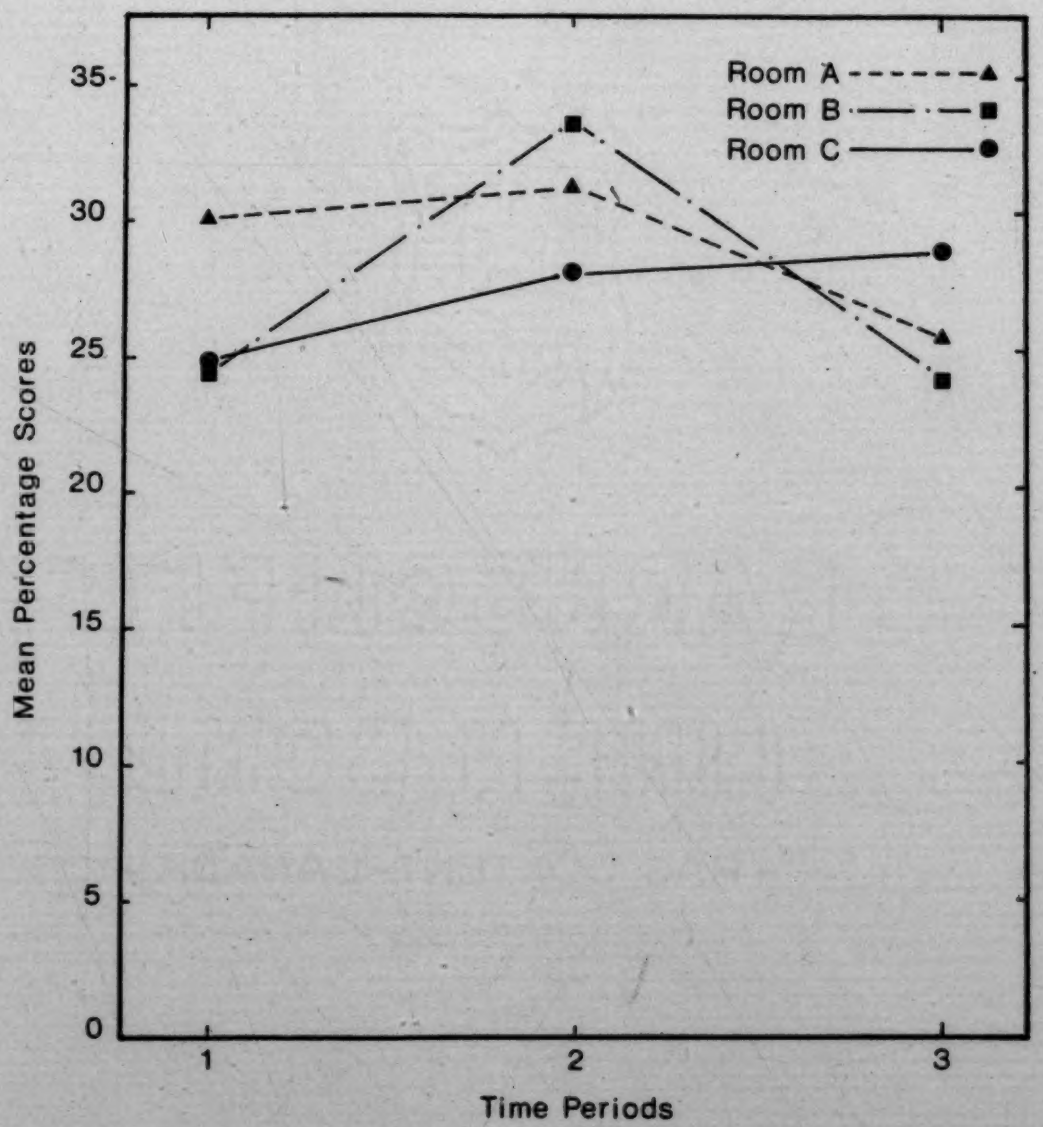

Figure 11. Mean percent scores for non-play for rooms A, B and C in the afternoon over 3 time periods.

low density condition (see Figure 10). This 3.6% variation was greater than the variation seen by the control room for non-play in the morning over the three time periods.

Another factor considered in examining the effect of spatial density on young children's behaviors was the difference found in the behavior of males and females in the two spatial densities. The mean percentages of time spent in social play and non-play within each room for males and females are presented in Table 6 and illustrated in Figures 12, 13 and 14. The scores for the percentage of social play in the high density condition for males and females remained fairly consistent despite the change in spatial density. However, the behavior of the males in Room B showed an increase in the percentage of time spent in solitary play in the high density condition (see Figure 12). This variation of 6.6% increase was greater than the variation seen for the males in the control room. The increase in solitary play resulted in a decrease of time spent in the two parallel play categories but the variations in the two parallel play categories were not greater than the variations for the males in the control room.

The females in Room B showed an increase of time spent in coordinated play and non-play behaviors (see Figures 13 and 14). The variations of 5.7% in coordinated play and 4.8% in non-play were greater than the variations in the same two categories seen by the females in the control room. The increase in coordinated play and non-play resulted in a decrease of time spent in the two parallel play categories but the variations in these two categories were not greater than those variations seen in Room C.

In Room A the males showed a 5% increase of time spent in non-play in the high density condition (see Figure 14). This variation was greater

Table 6

Mean Percentage Scores for Social Play and Non-play

For Males and Females Within Each Room Over Three Time Periods

		SEX					
		MALES			FEMALES		
		Room			Room		
Time Period	Social Play Category	A N = 9	B N = 7	C N = 7	A N = 7	B N = 5	C N = 9
1		16.2	12.0	7.9	14.1	9.9	14.7
2	S	16.4	18.6	8.8	11.3	10.1	17.4
3		12.8	19.3	7.5	18.4	9.6	16.9
1		9.1	12.2	13.7	5.6	11.5	17.1
2	P^-	9.2	8.1	9.7	13.0	8.9	12.7
3		13.7	9.2	13.9	11.0	10.6	13.4
1		22.3	19.5	27.9	22.2	27.7	17.0
2	P^+	17.9	16.3	24.3	18.9	24.4	21.0
3		21.0	14.2	30.5	17.8	34.0	21.8
1		19.8	23.5	25.2	21.9	18.8	21.5
2	C	17.9	26.3	30.3	20.6	24.5	18.5
3		19.4	30.5	19.1	22.5	17.3	19.3
1		27.9	25.5	25.1	32.7	26.4	27.9
2	NP	32.9	27.9	26.0	30.0	31.2	27.6
3		24.1	24.9	28.0	25.5	23.7	27.5

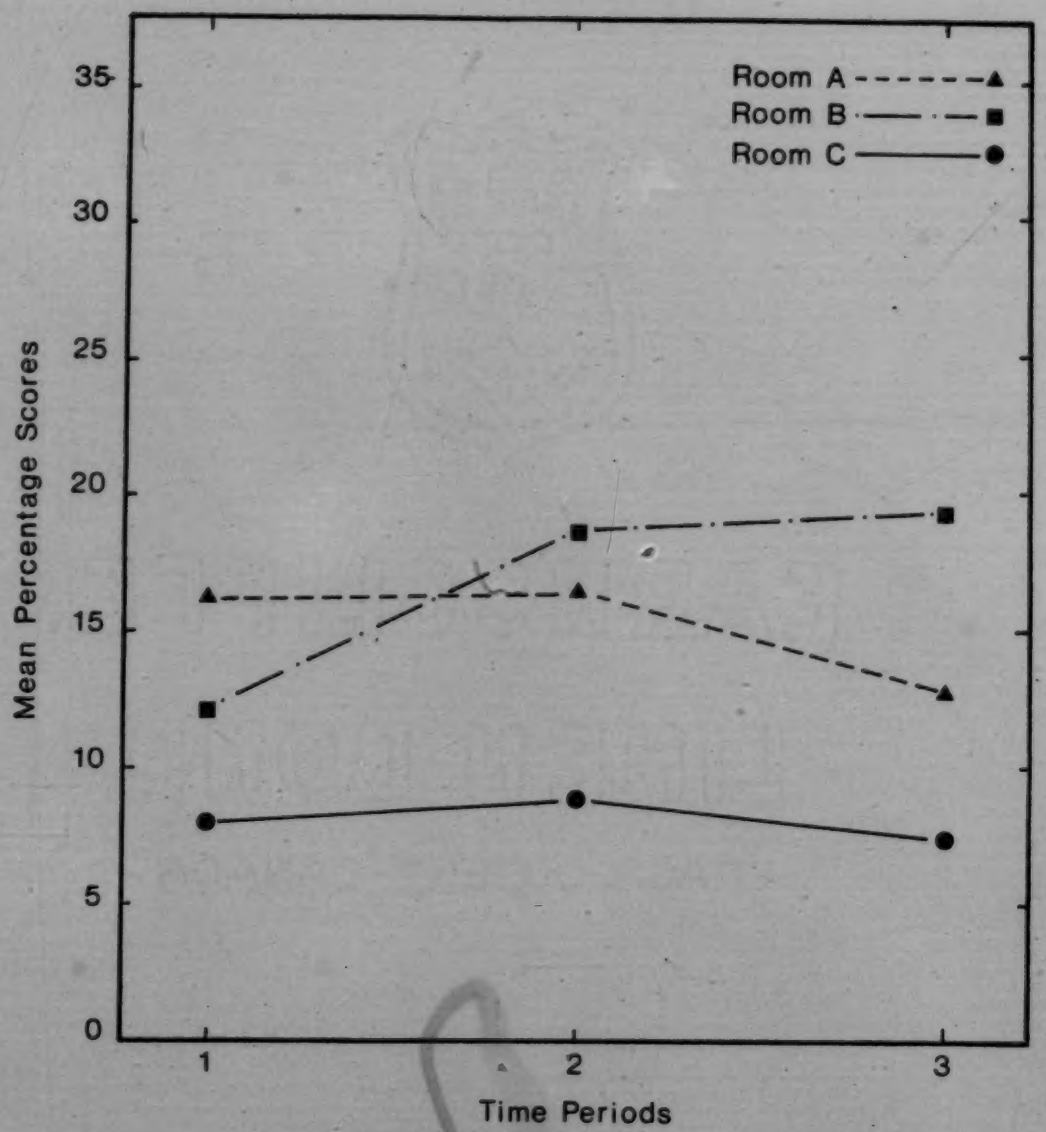

Figure 12. Mean percentage scores for solitary play for males in Rooms A, B and C over three time periods.

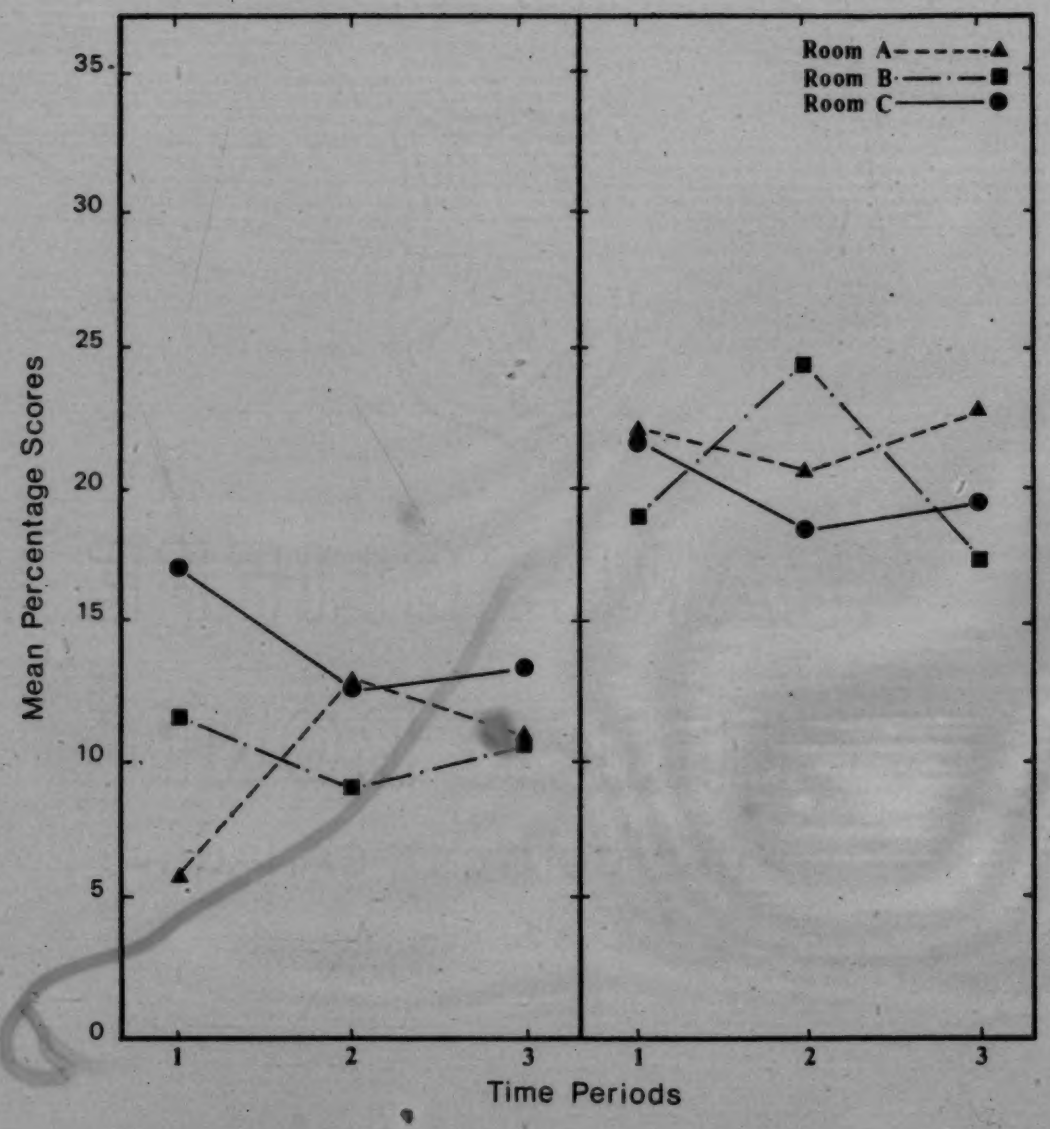

Figure 13. Mean percentage scores for parallel play with no language and coordinated play for females in Rooms A, B and C over three time periods.

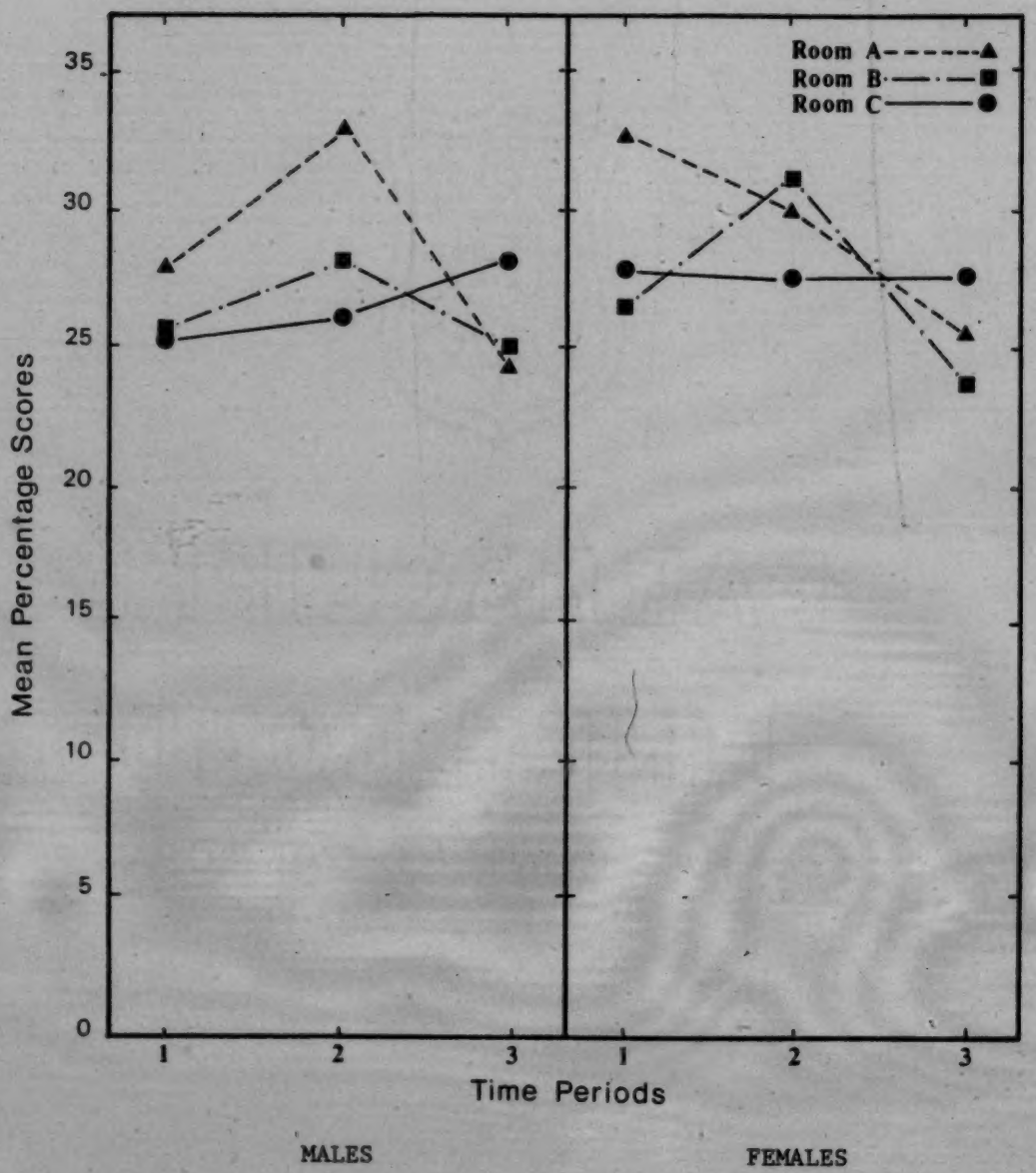

Figure 14. Mean percentage scores for non-play for males and females in Rooms A, B and C over three time periods.

than the variation seen for the males in the control room. The females in Room A displayed an increase of time spent in parallel play with no language and a decrease of time spent in non-play in the high density condition (see Figures 13 and 14). The variation of 7.4% in parallel play with no language and the variation of 2.7% in non-play were greater than the variations seen for the females in Room C over the three time periods.

The different ranges of the percentages in the different categories for each room were also examined. The males in both Rooms A and B showed lower percentages of parallel play with language in the high density condition than any score for the three rooms during the regular low density condition. The males in Room A showed a lower percentage of coordinated play in the high density condition than the scores for all the rooms during the regular low density condition. The males in Room B displayed a greater incidence of solitary play and a smaller percentage of parallel play with no language in the high density condition than any other scores in the original low density condition. The only difference found for the females was in Room B where the percentage of coordinated play increased more in the high density condition than the other scores for coordinated play during the low density condition.

The final factor analyzed was age. The children's mean percentage scores for each room for older and younger children are presented in Table 7 and illustrated in Figures 15 and 16. The scores for the percentage of social play in the high density condition for older and younger children remained fairly consistent despite the change in spatial density. The only changes seen were that the older children in Room A showed a lower incidence of parallel play with language in the high density condition than in the regular low density condition (see Figure

Table 7

Mean Percentage Scores for Social Play and Non-play

For Younger and Older Children Within Each Room Over Three Time Periods

		YOUNGER			OLDER		
		ROOM			ROOM		
Time Period	Social Play Category	A N = 8	B N = 7	C N = 6	A N = 8	B N = 5	C N = 10
1		17.8	12.3	11.1	12.9	8.8	12.1
2	S	17.8	17.7	12.0	10.6	11.3	14.5
3		17.8	19.8	16.7	12.9	8.9	10.4
1		9.0	13.6	16.3	6.1	9.5	15.4
2	P^-	12.5	8.9	13.0	9.2	7.8	10.4
3		14.5	9.1	13.9	10.5	10.7	13.4
1		21.5	20.8	19.5	25.7	25.8	23.1
2	P^+	18.2	17.0	21.0	18.6	23.6	23.3
3		17.7	17.9	24.7	21.4	29.3	26.2
1		16.6	24.8	21.5	22.0	23.2	24.0
2	C	12.7	24.2	23.2	25.5	27.3	23.9
3		18.8	26.3	18.4	22.8	24.1	19.7
1		29.2	26.3	31.3	30.6	27.2	23.9
2	NP	33.4	31.3	29.9	31.7	28.5	25.4
3		27.5	25.6	24.9	23.0	23.8	29.4

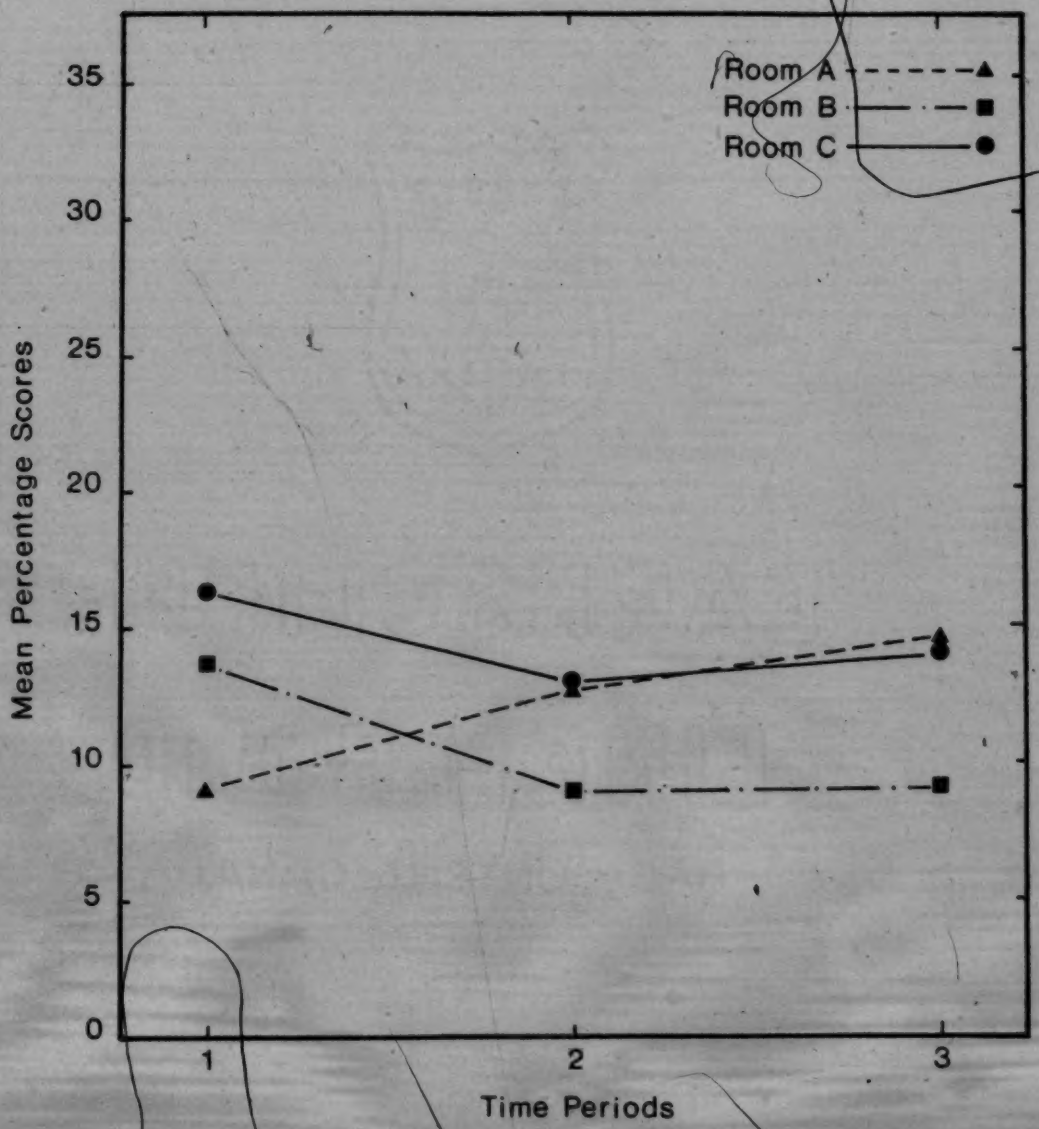

Figure 15. Mean percentage scores for parallel play with no language for the younger children in Rooms A, B and C over three time periods.

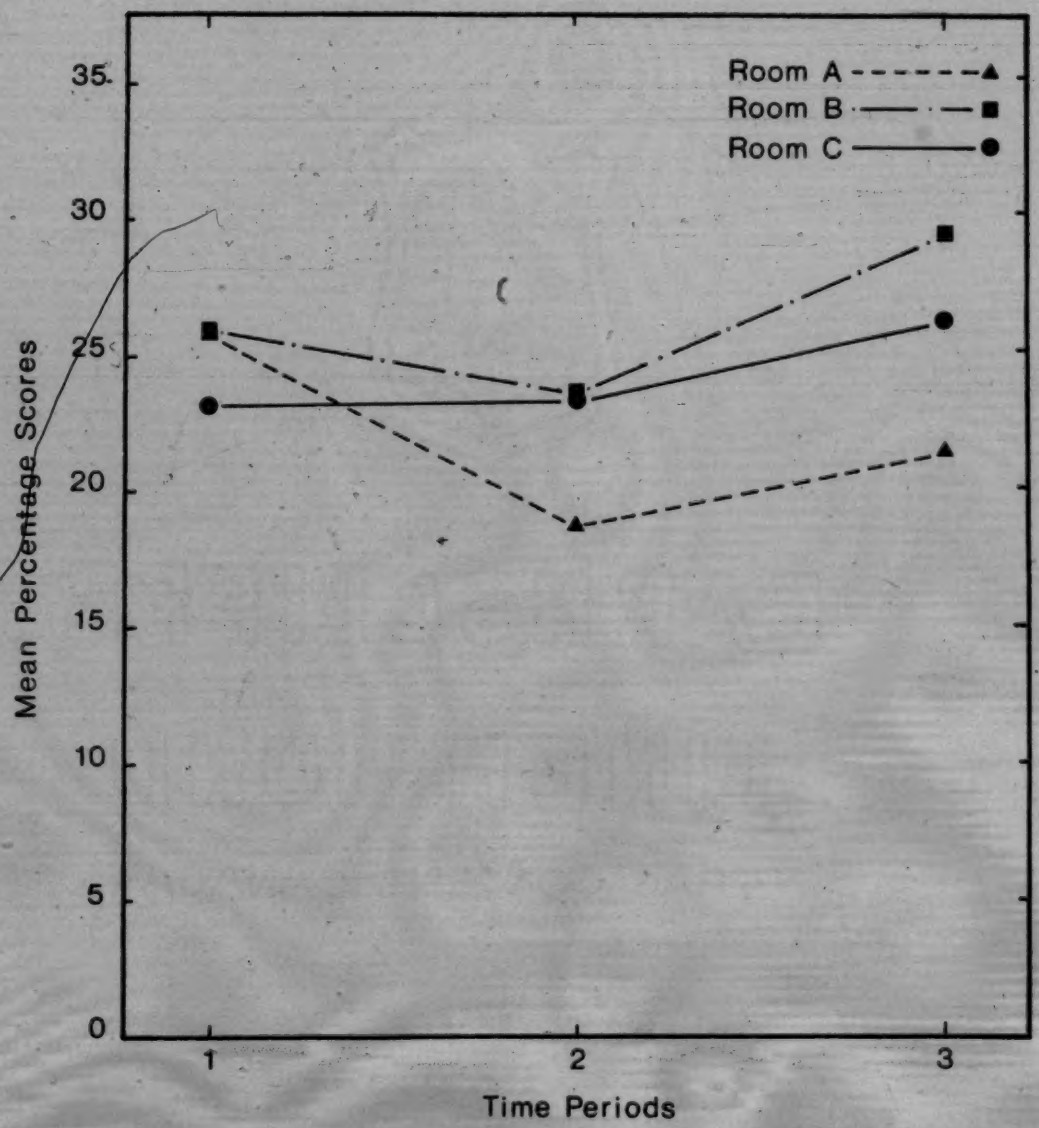

Figure 16. Mean percentage scores for parallel play with language for the older children in Rooms A, B and C over three time periods.

16). The 7.1% variation from the low density to the high density condition was greater than the variation seen for the older children in the control room. This decrease of time spent in parallel play with language resulted in an increase of time spent in parallel play with no language and also coordinated play. However, these variations in parallel play with no language and also coordinated play did not exceed the variations seen for the older children in Room C.

The younger children in Room B displayed a decrease of time spent in parallel play with no language in the high density condition (see Figure 15). The 4.7% variation in parallel play with no language exceeded the variation for the younger children in the control room over the three time periods. The decrease of time spent in parallel play with no language and also parallel play with language resulted in an increase of time spent in solitary play and non-play behavior but the variations in these categories did not exceed the variations seen in Room C in the same categories over the three time periods.

The younger children in Room A showed an increase in the time spent in parallel play with no language (see Figure 15). The 3.5% variation in this category was greater than the variation for the younger children in the control room over the three time periods. The younger children in Rooms A and B also showed an increase of time spent in non-play in the high density condition, whereas the younger children in Room C showed a decrease of time spent in non-play over the three time periods. However, it should also be noted that although the variations of scores for non-play in Rooms A and B did not exceed the variations seen in Room C for non-play, the time spent in non-play in Rooms A and B increased by 4.2% (Room A) and 5% (Room B) during the high density condition and then

decreased again during the low density returned condition. Whereas, in Room C, although the variation of 6.4% was greater than the variations seen in Rooms A and B, the time spent in non-play decreased over the three time periods. The younger children in Room A also displayed a decrease of time spent in parallel play with language and coordinated play but the variations in these categories did not exceed the variations seen in Room C in the same categories over the three time periods.

Occurrence of Social Play Categories

The children's social play behaviors were observed to determine the effect of spatial density. However, when the children's play behaviors were examined across the three time periods, there were only limited differences in the children's play between the three time periods so the children's scores were collapsed across the three rooms and the three experimental conditions. The scores for the types of play are presented in the Table Eight. The children spent about 22% of their time in coordinated play, 22% of their time in parallel play with language, 14% of the time in solitary play and 11% of the time in parallel play with no language. They spent the remaining 28% of the time in non-play activities.

However, there were also some differences in the children's play behaviors between rooms irrespective of changes in space. Rooms A and B generally displayed slightly more solitary play than the children in Room C. The children in Room C were involved in more parallel play with no language and also more parallel play with language than the other children. However, Rooms A and B showed less parallel play with language in the high density condition. The children in Room A displayed less coordinated play than the children in Rooms B and C.

The males and females in Room A did not display great differences in

Table 8

Approximate Percentage of Time Spent in each Social Play and Non-play Category within each Room Collapsed across Three Time Periods

	ROOM			
	A N = 16	B N = 12	C N = 16	Average
Solitary	15	14	13	14
Parallel - no language	10	10	14	11
Parallel - language	20	22	23	22
Coordinated	20	25	22	22
Non-play	29	27	27	28

the way they played but the males and females in Rooms B and C did play differently (see Figure 17). In Room B, the males spent more time in solitary play and coordinated play than the females, whereas the females spent more time in parallel play with language. In Room C, the males were involved in more parallel play with language and coordinated play than the females. The females spent more time in solitary play (see Table 6 and Figure 17).

There were differences in the way the younger and older children played (see Table 7). In the three rooms the older children were involved in more parallel play with language than the younger children. In Rooms A and B the younger children displayed more solitary play and parallel play with no language than the older children.

Cognitive Play Categories

Question 2: What differences occur between scores for children during two different spatial densities for:

(a) exploratory/functional play

(b) constructive play

(c) imitative/dramatic play

(d) testing/contesting play

The cognitive play categories consisted of exploratory/functional (EF), constructive (C), imitative/dramatic (ID), and testing/contesting (TC). The mean percentages of the children's scores in Rooms A and B in the two spatial density conditions (time periods 1, 2 and 3) are presented in Table 9 and illustrated in Figures 18 and 19. In general, the scores for Rooms A and B for the cognitive play categories did not show a greater variation between the experimental high density conditions and the regular low density condition than those variations found in the control

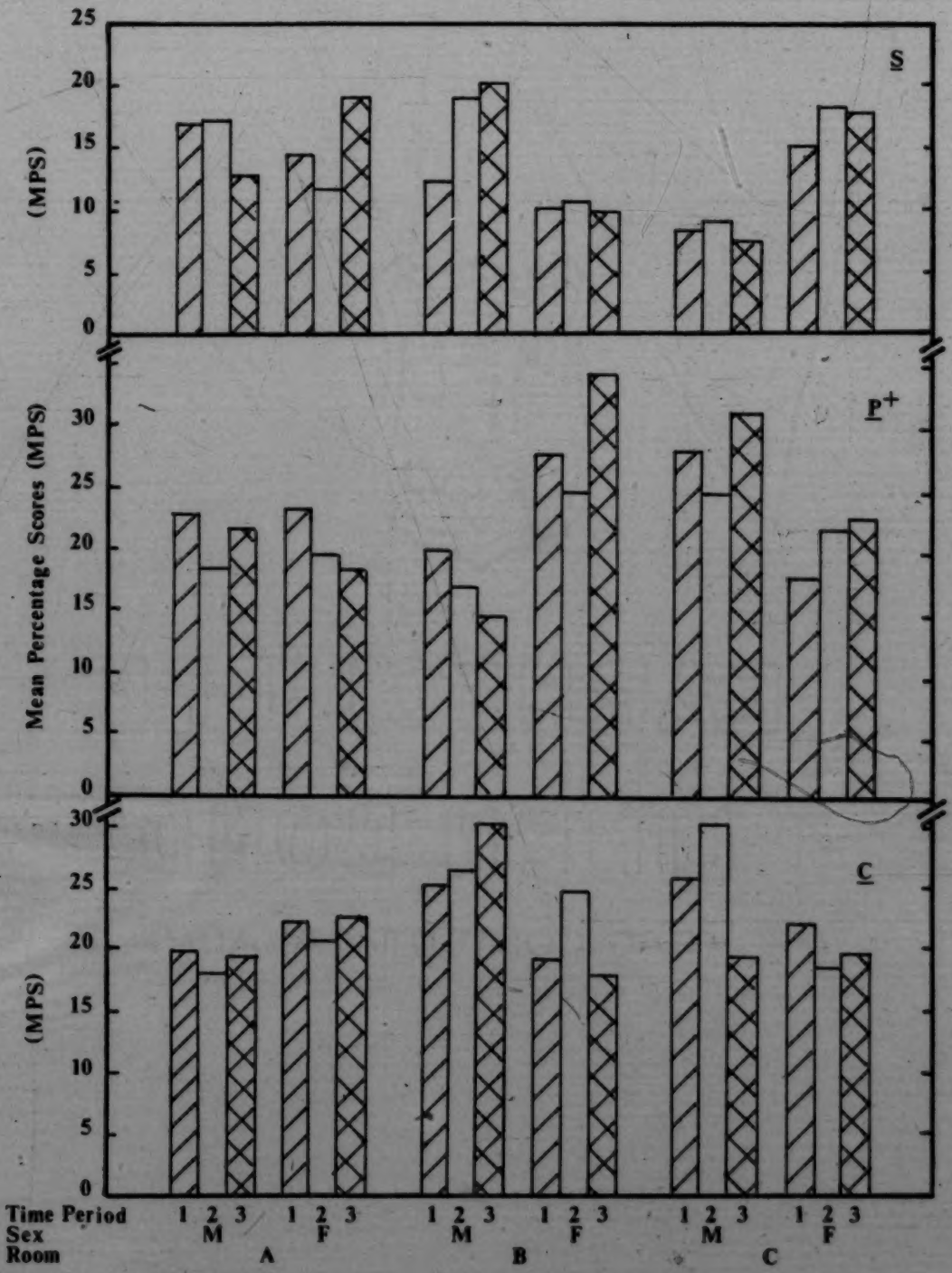

Figure 17. Mean percentage scores for solitary play (S), parallel play (P+) with language, and coordinated play (C) for males (M) and females (F) within each room over the three time periods.

Table 9

Mean Percentage Scores for Cognitive Play within each Room over Three Time Periods

Time Period	Cognitive Play Category	ROOM A N = 16	B N = 12	C N = 16
1		5.3	9.7	9.2
2	EF	5.0	9.3	8.2
3		7.5	12.4	7.2
1		32.3	24.6	33.4
2	C	26.6	21.4	29.6
3		30.1	22.5	26.6
1		23.8	35.0	28.1
2	ID	27.1	34.3	30.1
3		26.8	35.0	34.0
1		4.7	1.8	2.2
2	TC	4.8	4.3	3.7
3		3.4	3.1	3.7

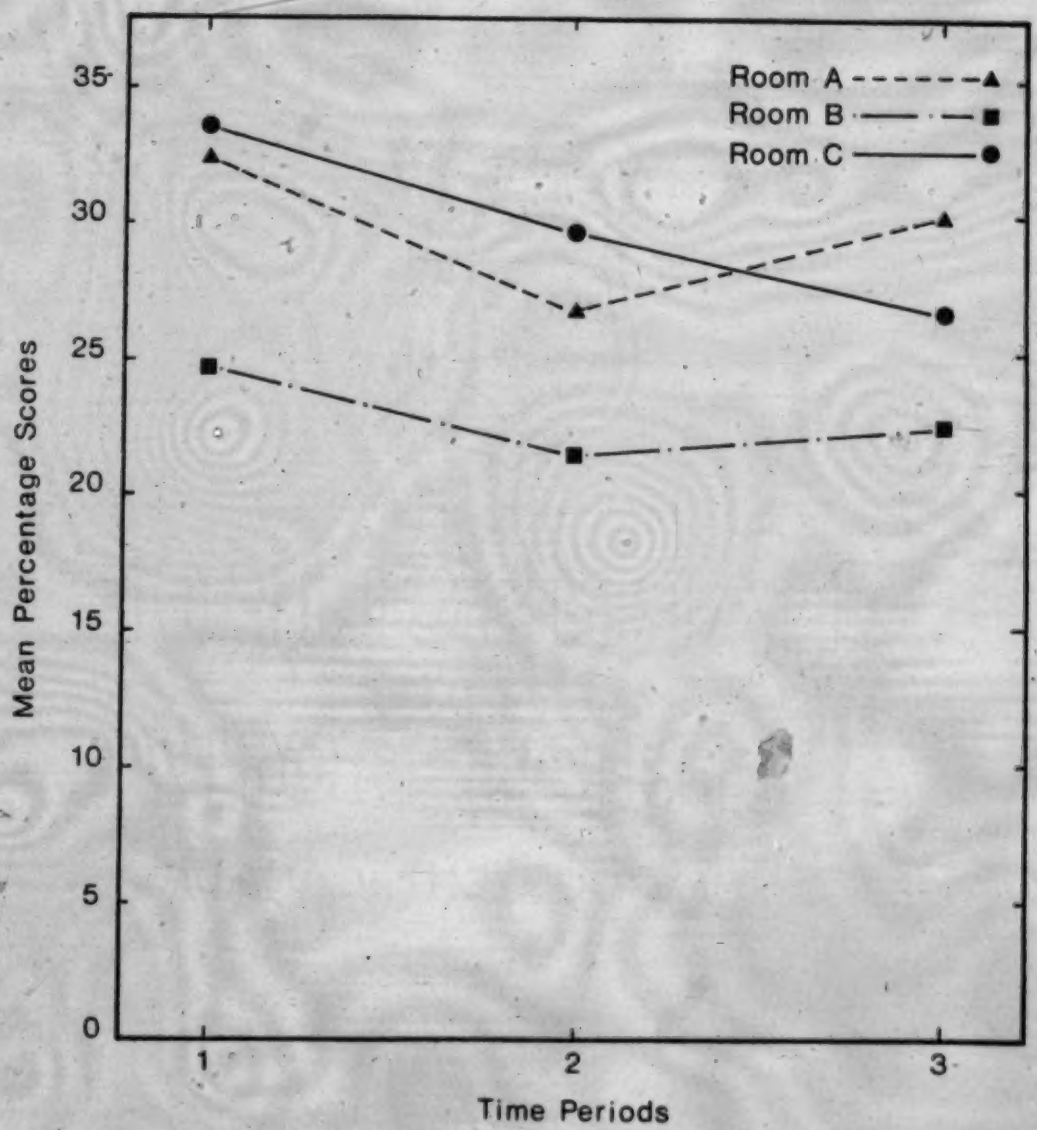

Figure 18. Mean percentage scores for constructive play for Rooms A, B and C over three time periods.

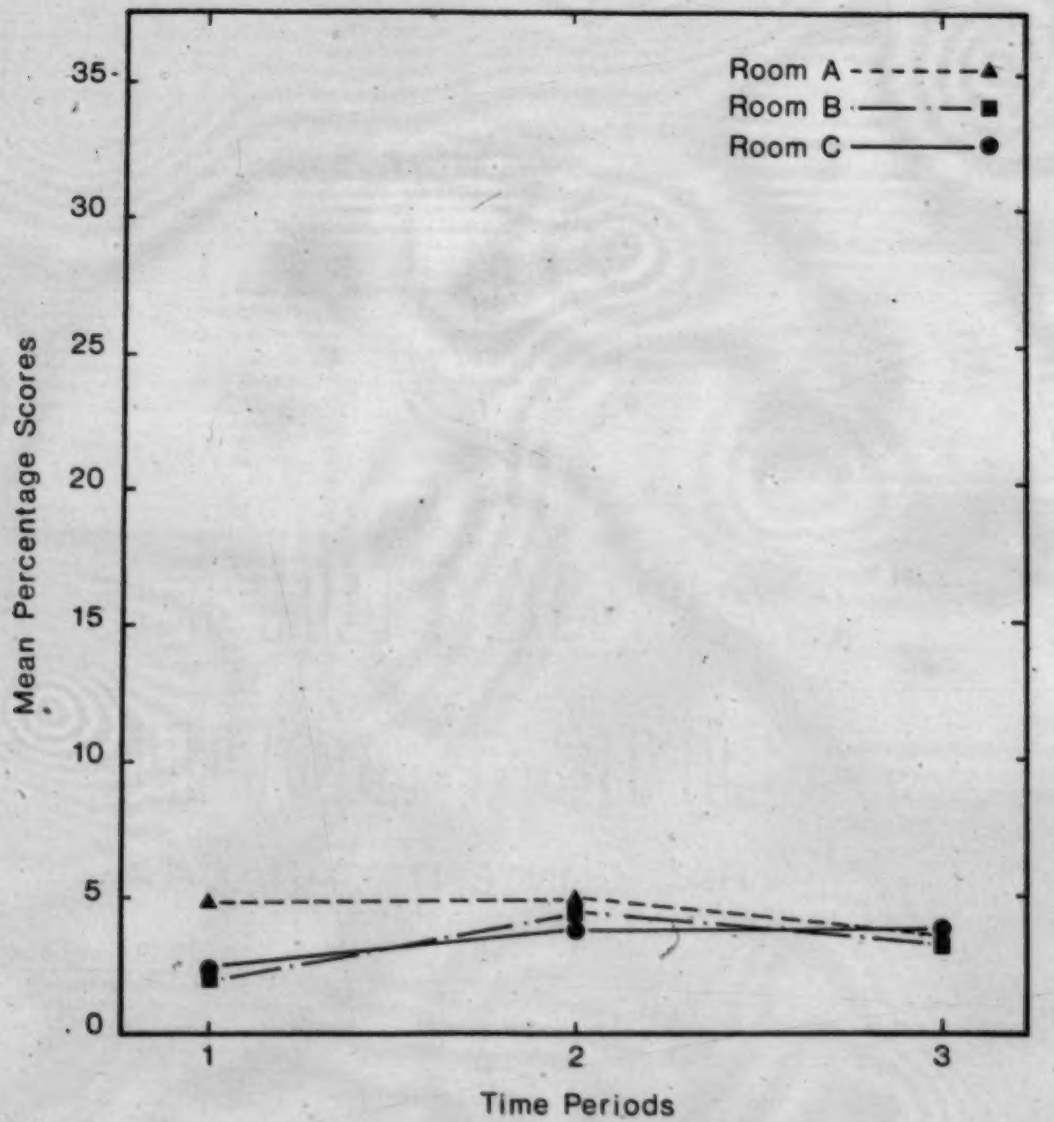

Figure 19. Mean percentage scores for testing/ contesting play for Rooms A, B and C over three time periods.

room over the three time periods. However, Room B did show an increase of time spent in testing/contesting play during the high density condition (see Figure 19). This 2.5% variation in testing/contesting play was greater than the variation seen in the control room for the same category over the three experimental time periods.

It was also found that the children in Rooms A and B showed a decrease of time spent in constructive play during the high density condition and then an increase in the return to the low density condition, whereas the control room displayed a decrease of 6.8% over the three time periods (see Figure 18). However, the variations for constructive play in the two experimental rooms did not exceed the variation seen for the control room and therefore this decrease of time spent in constructive play during the high density condition can not be considered due to a space change.

The factor, time of day, was also considered when examining the effect of space change on children's cognitive play behaviors. The mean percentage scores within each room for morning and afternoon are presented in Table 10. There appeared to be no effect of space change as the percentages remained fairly constant for morning and afternoon during the two spatial densities (time periods 1, 2 and 3). The only effect of space change in the morning was seen in Room B where there was an increase of time spent in testing/contesting play during the high density condition. However, Room B also showed an increase of time spent in testing/contesting play during the afternoon of the high density condition. Room B also showed a decrease of time spent in constructive play in the afternoon during the high density condition (see Figure 20). This 6% variation in constructive play exceeded the variation for this category seen in Room C over the three time periods. Room A showed an increase of imitative/

Table 10

Mean Percentage Scores for Cognitive Play

Within Each Room for Morning and Afternoon over Three Time Periods

		MORNING			AFTERNOON		
	Cognitive	Room			Room		
Time	Play	A	B	C	A	B	C
Period	Category	N = 16	N = 12	N = 16	N = 16	N = 12	N = 16
1		4.5	7.5	10.4	6.1	11.8	7.9
2	EF	5.3	7.1	6.7	4.6	11.5	9.6
3		6.8	12.4	7.4	8.1	12.3	7.3
1		32.9	21.8	34.5	31.6	27.3	32.3
2	C	24.1	23.4	31.3	29.1	19.3	27.9
3		30.8	19.8	24.1	31.4	25.1	29.1
1		24.8	38.6	24.9	22.7	31.3	31.2
2	ID	28.2	38.2	32.0	25.9	30.4	38.1
3		23.7	36.2	39.2	29.8	33.8	28.8
1		4.0	1.1	2.5	5.3	2.5	1.8
2	TC	5.1	3.6	3.2	4.4	5.0	4.1
3		4.0	3.3	3.5	2.8	4.5	3.9

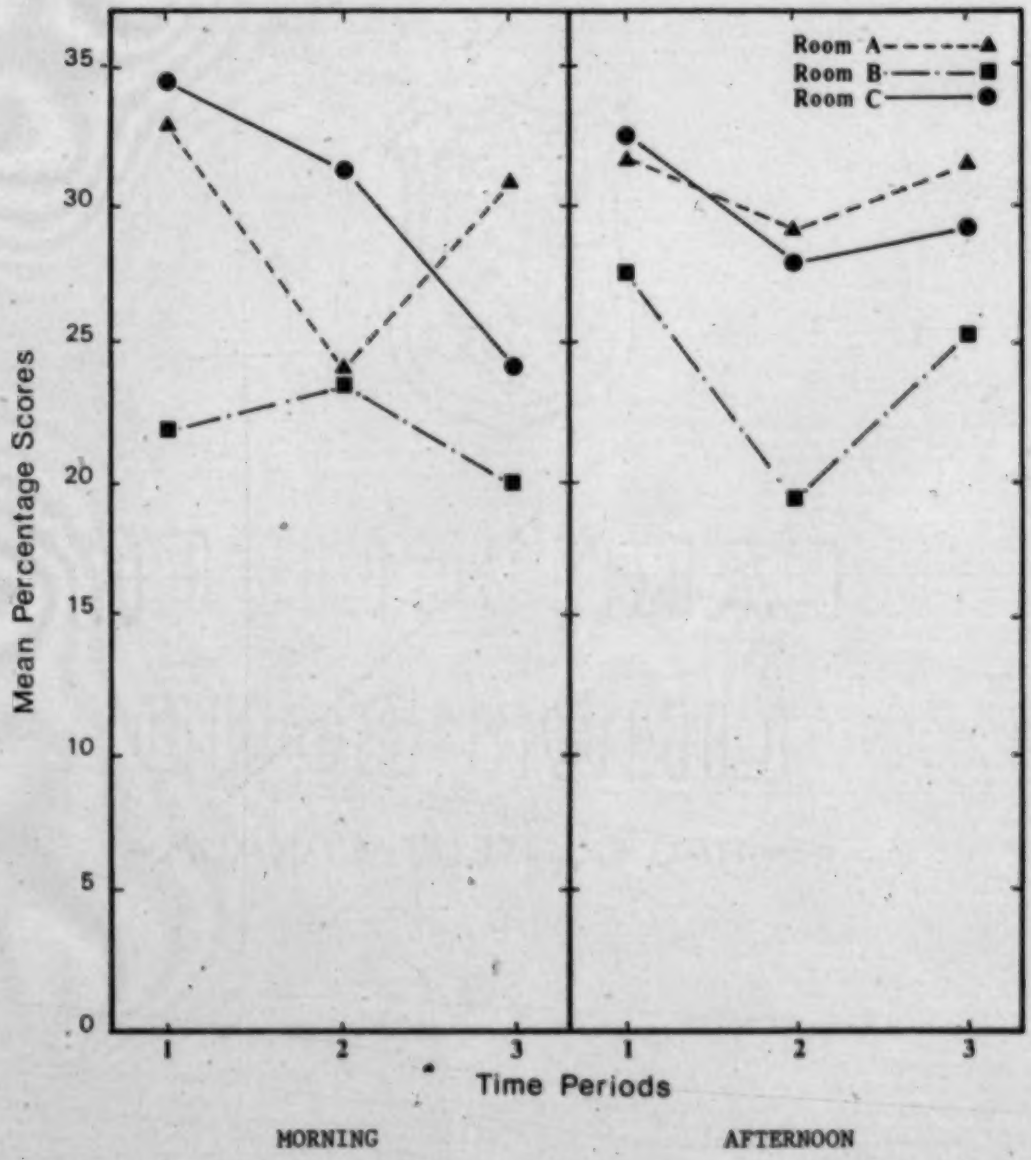

Figure 20. Mean percentage scores for constructive play within each room for morning and afternoon over three time periods.

dramatic play in the afternoon during the high density condition. However, this 3.2% variation was only slightly greater than the variation seen in the control room over the three time periods.

Another factor to be considered when examining the effect of space change on children's cognitive play behaviors was the possibility of differences between males and females. The mean percentage scores within each room for males and females are presented in Table 11. The scores for the percentage of play in the high density condition remained fairly constant despite the changes in the amount of floor space. However, the females in Room B showed a decrease of time spent in constructive play and an increase of time spent in testing/contesting play in the high density condition (see Figure 21). The variations of 5.6% in constructive play and 3.7% in testing/contesting play were greater than the variations seen in the control room in the same two categories over the three time periods.

The final factor examined was the effect of differing spatial densities across different ages. The mean percentage scores for the older and younger children within each room are presented in Table Twelve. The scores for the percentage of play in the high density condition did not vary greatly from the scores for the time spent in play during the regular low density condition. However, the older children in Room A showed an increase of time spent in imitative/dramatic play during the high density condition. The 5.8% variation in imitative/dramatic play was slightly greater than the variation seen in the control room in this category over the three time periods. The younger children in Rooms A and B displayed a decrease of time spent in exploratory/functional play in the high density condition. The 1.8% and 1.2% variations exceeded the variation seen in the control room for exploratory/

Table 11

Mean Percentage Scores for Cognitive Play for Males and Females within each Room over Three Time Periods

		SEX					
		MALES			FEMALES		
	Cognitive	Room			Room		
Time	Play	A	B	C	A	B	C
Period	Category	N = 9	N = 7	N = 7	N = 7	N = 5	N = 9
1		6.3	10.8	13.1	4.1	8.2	3.1
2	EF	5.6	12.0	7.3	4.2	5.6	8.8
3		7.6	12.6	6.0	7.2	12.0	7.6
1		31.2	16.4	30.4	33.6	36.0	35.8
2	C	23.5	14.9	25.8	30.7	30.4	32.5
3		28.0	14.1	21.8	35.0	34.2	30.4
1		25.5	43.4	30.3	21.5	23.2	26.3
2	ID	27.9	39.5	38.2	25.9	27.1	23.8
3		29.9	43.8	38.9	22.8	22.6	30.2
1		5.4	2.0	1.5	3.7	1.5	2.8
2	TC	5.4	3.6	2.2	4.1	5.2	3.8
3		2.0	3.8	3.7	5.2	4.1	3.8

Table 12

Mean Percentage Scores for Cognitive Play

for Older and Younger Children within each Room over Three Time Periods

		OLDER Room			YOUNGER Room		
Time Periods	Cognitive Play Category	A N = 8	B N = 5	C N = 10	A N = 8	B N = 7	C N = 6
1		3.4	4.9	8.6	7.3	12.5	10.1
2	EF	4.4	5.7	6.6	5.5	11.3	10.9
3		7.1	7.7	5.3	8.3	15.7	10.7
1		31.5	34.1	36.6	33.1	17.8	28.3
2	C	23.0	28.9	31.6	30.2	16.0	26.3
3		27.4	32.0	27.6	34.8	15.7	25.0
1		26.5	26.5	27.2	20.0	41.0	29.4
2	ID	32.3	30.0	29.6	21.9	37.4	30.8
3		30.9	30.4	32.6	22.7	38.2	36.3
1		3.7	2.4	2.6	5.7	1.5	1.4
2	TC	5.0	6.2	4.7	4.6	2.9	1.8
3		3.2	3.4	4.5	3.7	4.3	2.4

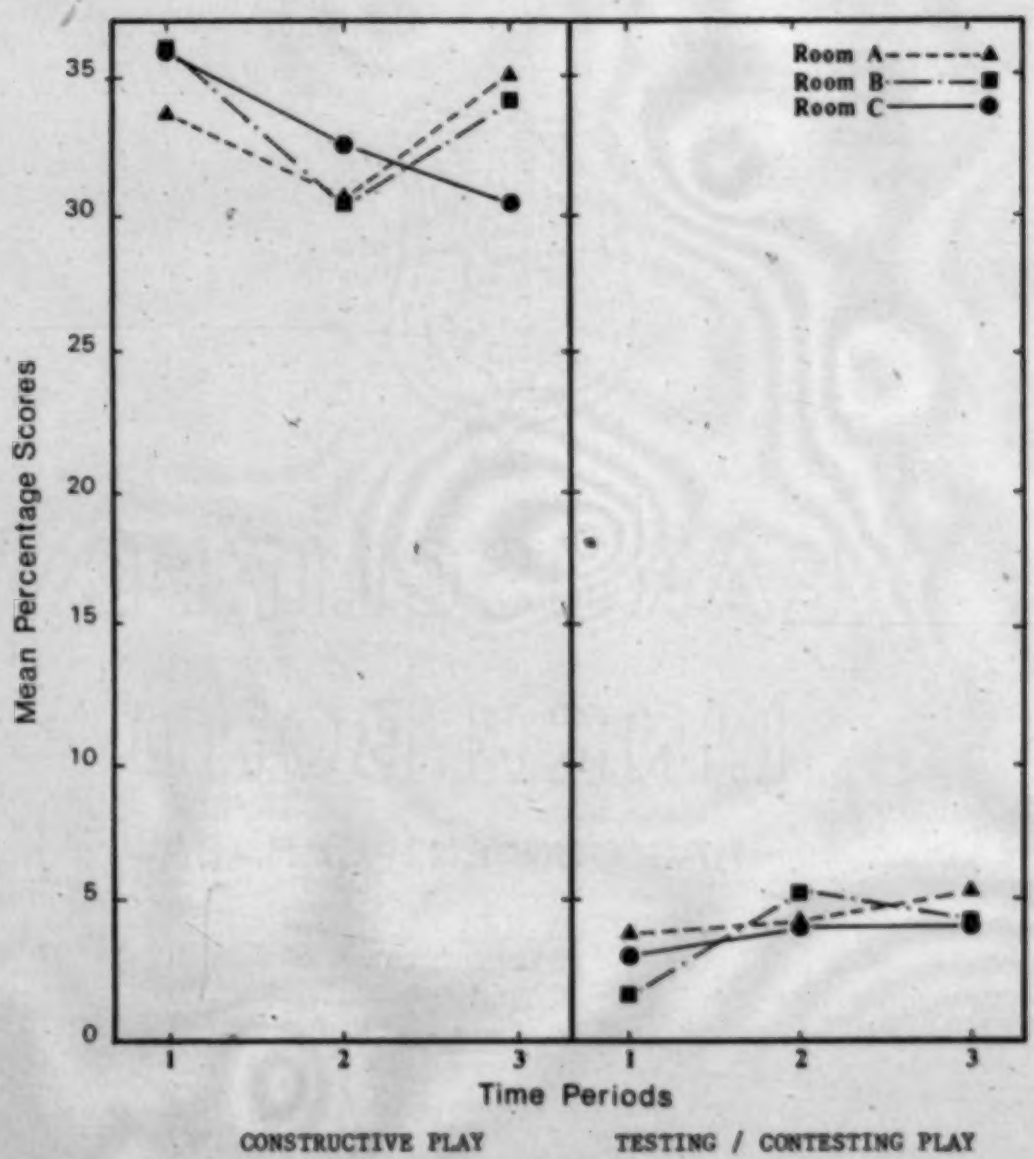

Figure 21. Mean percentage scores for constructive play and testing/contesting play for the females in Rooms A, B and C over three time periods.

functional play over the three time periods. The younger children in both rooms displayed a decrease of time spent in all but one category of cognitive play during the high density condition. This decrease of cognitive play resulted in an increase of time spent in non-play (which was noted in the discussion of the results of social play for the younger and older children). However, the differences in many of these cognitive categories did not exceed the differences seen in the control room over the three time periods.

Generally the change in spatial density had a limited effect on the children's cognitive play behaviors. The only notable effect of space change was seen in Room B where there was an increase of time spent in testing/contesting play. In the afternoon Room A showed an increase of time spent in imitative/dramatic play and Room B showed a decrease of time spent in constructive play. Only the females in Room B showed a decrease of constructive play and an increase of time spent in testing/contesting play. The older children in Room A displayed an increase of time spent in imitative/dramatic play during the high density condition whereas the younger children in Rooms A and B displayed a slight decrease of time spent in exploratory/functional play in the high density condition. The younger children in both experimental rooms showed a general decrease of time spent in all but one category of cognitive play.

Occurrence of Cognitive Play

The children's cognitive play behaviors were measured to determine the effect of spatial density. However, there were some similarities and some differences in the children's play behaviors across the three time periods in each of the rooms, but since there were only limited differences in the children's play between the time periods, the children's

scores were collapsed across the three rooms and the three experimental time periods. The children spent about 31% of the time in imitative/dramatic play, about 28% of the time in constructive play, 8% of the time in exploratory/functional play and 3% of the time in testing and contesting play. Table 13 presents each room's percentage scores.

There were also some differences in the way males and females played (see Table 11). The males in the three rooms displayed more exploratory/functional play and more imitative/dramatic play than the females. However, the variations between the males in the different rooms were large. For instance, the range for the males for exploratory/functional were as follows: Room A-7%; Room B-12%; Room C-9%. The range of scores for imitative/dramatic play was even greater: Room A-28%; Room B-42%; Room C-36%. The females displayed more constructive play than the males. This difference between the scores of constructive play for males and females was greatest in Room B where the females spent approximately 34% of their time in constructive play. The males spent approximately 15% of their time in constructive play.

There also were some differences in the way the older and younger children played (see Table 12). In all the rooms the younger children generally spent more of their time in constructive play than the older children. In Rooms B and C the older children displayed more constructive play than the younger children. In Room A the older children were involved in more imitative/dramatic play than the younger children. In Rooms B and C, it was the younger children who displayed more imitative/dramatic play than the older children.

Effect of High Density on the Children's Play Behaviors During the Return to the Low Density

Question 3: Does a period of time spent in a high density condition

Table 13

Approximate Percentage of Time Spent in each Cognitive Play Category within each Room Collapsed across Three Time Periods

	ROOM			
	A N = 16	B N = 12	C N = 16	Average
Exploratory/Functional	6	10	8	8
Constructive	30	23	30	28
Imitative/Dramatic	26	35	30	31
Testing/Contesting	4	3	3	3
Non-play	29	27	27	28

have a subsequent effect on the way children play in a low density condition?

The examination of the children's play behaviors following the return to low density was conducted in order to determine whether the change in behavior due to the high density would continue. When the scores for the low density returned condition (time period 3) were compared to the scores of the regular low density condition (time period 1), it was noted that there was only a very limited subsequent effect of high density on the social and cognitive play behaviors in Rooms A and B. However, Room A showed an increase of time spent in parallel play with no language (variation of 5%) and a decrease of time spent in non-play (4.7%) during the low density returned condition. Room B displayed an increase of time spent in solitary play (variation of 4.1%) and a decrease of time spent in non-play (1.9%) in the low density returned condition (see Table 4).

With regard to the male and female behavior, the males in Room A showed a 3.4% decrease of time spent in solitary play, a 4.6% increase of time spent in parallel play with no language and a 3.8% decrease of time spent in non-play during the low density returned condition. The males in Room B showed a 7.3% increase of time spent in solitary play in the low density returned condition. The females in Room A showed a 4.3% increase of time spent in solitary play, a 5.4% increase of time spent in parallel play with no language and a 7.2% decrease of time spent in non-play during the low density returned condition. The females in Room B showed a 6.3% increase of time spent in parallel play with language and a 2.7% decrease of time spent in non-play during the low density returned condition (see Table 6).

With regard to age, the older children in Room A showed a 4.3% decrease of time spent in parallel play with language and a 7.6% decrease of time spent in non-play in the low density returned condition. The older children in Room B showed an increase of 3.5% of time spent in parallel play with language from the low density to the low density returned condition. The younger children in Room A showed a 5.5% increase of time spent in parallel with no language during the low density returned condition. The younger children in Room B displayed a 7.5% increase in solitary play and a 4.5% decrease in parallel play with no language from the low density to the low density returned condition (see Table 7).

The only common effect for cognitive play was that the children in Rooms A and B displayed a 2.2% and a 2.7% respectively, increase of time spent in exploratory/functional play during the low density returned condition. The males in Room A showed a 3.4% decrease of time spent in testing/contesting play whereas the females in Rooms A and B showed a 1.5% and 2.6% respectively, increase of time spent in testing/contesting play during the low density returned condition. The older children in Room A exhibited a 3.7% increase of time spent in exploratory/functional play during the low density returned condition. The younger children in both rooms also displayed an increase of time spent in exploratory/functional play (1.0% and 3.2% respectively), and while the younger children in Room A showed a 2% decrease in testing/contesting play the younger children in Room B showed a 2.8% increase of time spent in testing/contesting play during the low density returned condition.

When the high density condition was removed and the children returned to the regular low density condition, the amoung of time spent in most of the categories for social play and cognitive play returned to

that of the original low density condition. However, there was an increase of time spent in play and less time spent in non-play during the low density returned condition. This increase of play was evident by an increase of time spent in either solitary play or parallel play with no language and exploratory/functional play. The children in Room B also spent more time in testing/contesting play when they returned to the low density condition.

In this chapter, findings from the data analysis have been presented to correspond to the research questions. Generally, the change in spatial density showed only a limited effect on the children's play behaviors. The play categories that did show a change due to spatial density were discussed. Other factors examined were room, sex and age differences. Conclusions and implications of the findings will be discussed in Chapter Five.

CHAPTER FIVE:

DISCUSSION

This research was an attempt to learn more about the interaction between the degree of spatial density and four and five year old children's play behaviors in a day care center. The children's social play, cognitive play and non-play behaviors were examined during the spatial density conditions of low density, high density, and a return to the low density condition. Other factors examined were room, time of day, sex, and children's age.

The data collected were analysed by the exploratory technique. The percentage of time that the children spent in each of social play, cognitive play and non-play during the low density condition, the high density condition and the low density returned condition were compared. Only variations in the scores of the two experimental rooms which exceeded those variations of the control room over the three time periods were considered to be of importance.

Social Play

The findings related to the first question on social play behaviors were examined. The only differences between the scores for the children under the two different spatial densities for Rooms A and B were that the children spent more time in non-play during the high density condition than during the low density condition. The children in Room A also spent less time in parallel play with language, while the children in Room B spent more time in solitary play during the high density condition than during the low density condition.

There were some differences in the occurrence of social play categories in the different rooms for males and females, younger and

older children. These differences must be considered when examining the effects of space change on children's behaviors as possibly being created by differences between the rooms. The differences between rooms include such things as different number of children in each room (Room A = 16, Room B = 12, Room C = 16), different distribution of younger and older males and females (see Table 2) or even possibly different adult interactions.

Other factors to be considered, besides room differences, are time of day, sex and age of children. The children in Room B appeared to be more sensitive to the high density situation in the afternoon rather than in the morning as the children showed an increase of time spent in solitary play and non-play in the afternoon during the high density condition. This may have occurred due to the fact that Room B had a greater number of younger children than older children compared to Room A (Room A: older = 8, younger = 8; Room B: older = 5, younger = 7).

There were only a few differences found with regard to how the males and females reacted to the change in spatial density. The females in Room A displayed an increase of time spent in parallel play with no language. The males in Room B showed an increase of time spent in solitary play in the high density condition and the females increased their time in coordinated play. Again these results may have been due to the different number of younger and older males and females in the two Rooms (see Table 2). Room B had a greater number of younger males than older males, whereas Room A had a slightly greater number of younger females than older females. These younger children may have been more sensitive to the changes in spatial density.

The scores for the older and younger children in the two rooms also

displayed some differences. The older children in Room A displayed less parallel play with language in the high density condition. The younger children in Room A showed an increase of time spent in parallel play with no language during the high density condition, whereas the younger children in Room B showed a decrease of time spent in parallel play with no language during the high density conditions.

It appears that, to a certain degree, the children reduced the social pressures created by the higher density by isolating themselves more and not becoming involved as much in play. The reduction in the level of socialization was seen by the increase of non-play behaviors in both experimental rooms and the increase of time spent in parallel play with no language by the females and younger children in Room A, and also by the increase of time spent in solitary play in Room B. It was noted that during the high density condition, the children increased the time spent in routine non-play, which included washroom behaviors. The children might have been spending more time in the washroom in order to expand their play space or to further isolate themselves. However, the children's actual use of the washroom was not determined as all behavior in this area was coded as non-play.

When examining the factors time of day, sex and age of the children along with the effect of spatial density, it appears that the younger children may have been the most sensitive to the space change. Room B had a greater number of younger children than older children compared to Room A and it was Room B that showed a greater effect to the high density, especially in the afternoon. Many of the children arrived at the day care center very early in the morning and the younger children may have become more tired and therefore more sensitive to the effects of extra stimula-

tion of the high density situation by mid-afternoon. When examining the scores for the younger children in the two experimental rooms (see Table 7) the younger children showed an increase of time in social behaviors at a lower developmental level during the high density condition. The younger children in Room A displayed an increase of time spent in parallel play with no language and a decrease of time spent in parallel play with language and coordinated play. Whereas the younger children in Room B displayed a decrease of time in the two parallel play categories with an increase of time in solitary play and non-play. The younger children appeared less able to cope with the excess stimulation created by a high density condition. It is also very possible that the older children may have encroached upon the younger children's space by forcing the younger children to play more on their own or to remain uninvolved. The older children then would have been able to cope with the high density condition at the expense of the younger children and to appear to be unaffected by the high density condition. However, there is a lack of research on the effects of varying spatial or social densities on differing age groups and therefore it is difficult to determine exactly why the younger children were more sensitive to the high density condition.

The findings that the higher spatial density condition led to less social interaction and more uninvolvement supports some of the research done on spatial density. Loo (1972, 1976, 1979) also found that in a higher density children were involved in less social interaction and spent more time onlooking than playing. Shapiro (1975) found that children in more crowded situations became less involved in play and instead their behavior became more random and the children also spent more time as onlookers.

Cognitive Play

With regard to the second research question on the effect of spatial density on cognitive play behaviors, it was found that there were no differences between scores for the children under the two different spatial densities for exploratory/functional play, constructive play and imitative/dramatic play. Only Room B displayed an increase of time spent in testing/contesting play during the high density condition.

However, the other factors of room differences, time of day, sex and age of the children may have had an effect on the children's behaviors. The children in Room A showed an increase of imitative/dramatic play in the afternoon, whereas the children in Room B displayed a decrease of time spent in constructive play in the afternoon during the high density condition. The only differences between the males and females were seen in Room B where the females showed a decrease of constructive play and an increase of testing/contesting play in the high density condition. With regard to the ages of the children, the older children in Room A showed an increase of time spent in imitative/dramatic play during the high density condition. The younger children in both rooms showed a decrease of time spent in exploratory/functional play during the high density condition. The younger children in Room A displayed a decrease of time spent in testing/contesting play, whereas the younger children in Room B showed an increase of time spent in testing/contesting play.

Examining the children's scores in cognitive play it appears that many of the variations seen in the two experimental rooms were not greater than the variations seen in the control room. However, examining all the scores for the younger children in Rooms A and B it appears that there was a general decrease of time spent in cognitive play during the high density

condition. The younger children in Rooms A and B showed a slight increase of time spent only in one category each, imitative/dramatic play in Room A and testing/contesting play in Room B. The decrease of cognitive play in the high density condition may have been due to too many distractions and interruptions in the more crowded situation. As a result, the children may not have been able to sit and attend to constructive tasks but instead sought out activities that required less concentration, such as imitative/dramatic play, or possibly just chose to be uninvolved. This finding concurs with Rohe and Nuffer (1977) who stated that a high density situation affected the ability of the child to attend to tasks with clearly defined goals.

There was an effect of spatial density on testing/contesting play in Room B. Most of this category of play included a puzzle activity where a child set himself the task. In Room B the puzzles were located at a small table so this was more of individual task, rather than a group task. It is possible that in the high density condition the children might have chosen activities that allowed for more privacy in order to be able to attend to the task more effectively. Room A had puzzles too, but they were located on a larger table and so provided a slightly different setting, which may account for the room differences with this cognitive play category. This possible wish for more privacy supports Rohe and Nuffer (1977) and Massing (1979) who stated that children preferred using a more enclosed and private setting as opposed to one that was open to include more children. This was especially noticeable in more crowded situations.

Social Play and Cognitive Play

In this study the children's environment was altered when the floor

space in Rooms A and B was changed. This change in floor space and the creation of a high density condition resulted in the children changing their behavior. The children interacted less with one another, changed their type of playing and often became uninvolved during the high density condition. The variations found in the children's social and cognitive play behaviors support the theory that there is an interaction between children and their environment and that changes in the environment do influence children's behaviors (Gump, 1978; Hung, 1961; Lee, 1976). However, in this study, there were other important factors interacting and operating, besides spatial density, that influenced the children's behavior. The time of day, children's ages, sex, and room differences appeared to be the most significant. The time of day has already been discussed. The difference seen in the children's behaviors over the three time periods in the different rooms was an important factor. One of the interesting differences among the three rooms was the behavior of the males and females in each room. First, the males in Room B spent twice as much time in solitary play as did the Room C males, whereas the Room B females spent less time in solitary play than did the Room C females. Secondly, the Room B males spent less time in constructive play and more time in imitative/dramatic play than the males in either Room A or Room C. The younger children in Room B spent less time in constructive play and more time in imitative/dramatic play than did the younger children in either Room A or Room C.

Generally, not only did the children in each room display different play behaviors but the children in the two experimental rooms also reacted differently to the spatial density changes. Although the children in both rooms appeared to become involved in less social interaction during the high density condition, Room B seemed to be more sensitive to the high

density condition. Although the children in Room A continued with parallel play during the high density condition there was less use of language. During the same high density condition the children in Room B preferred to play alone or become totally uninvolved.

These differences between rooms could be the result of several factors. The first, a factor previously discussed, is the variation in the group composition which is seen in the different numbers of younger and older males and females in each room and which may have created the different play behaviors in the rooms. In further research this will be an important factor to try to control. However, factors such as children's personalities, their background experiences, their feelings and their perceptions of the situation all interact to create inter-individual differences. These factors which create individual differences are more difficult to control in research but may play an important part in affecting children's behaviors (Lee, 1976).

Another factor that may have had a great influence on the children's behaviors was the teacher and adults interacting with the children. The teacher's personality and how she related to and interacted with the children might have influenced the children's reaction to the changes in their environment. It was interesting to note that during data collection the observers were able to make informal observations while in rooms and it was very noticeable that each of the teachers in charge had very different teaching styles. Where one interacted often with the children and became very involved in their play, another teacher interacted considerably less and mainly to discipline and redirect behavior. The children in one room were given more freedom to choose activities, the children in the other room were often guided to activities by their

teacher's actions. Also the type of activities that were made available for the children by the teachers may have affected the children's behavior. Some of the teachers may have been more sensitive to the children's needs and interests and therefore better aware of what activities should be made available. Such an awareness and sensitivity to the children's needs and interests may have had an affect on the children's behavior. Interviews with the teachers (Glengarry Project, 1980) were made and it became apparent that they felt the effect of the high density situation and by the afternoon felt tired and under more stress. They also reported that the presence of the observers influenced and possibly changed their own behavior during the free-choice play time. This may have had an effect on the children's behavior.

It appeared that there are many factors operating and interacting in the environment which influenced the children's behavior. It is difficult to determine exactly which factors are operating and researchers who examine the behavior of only one group of children must be aware of this. Smith and Connolly (1977) examined the effects of crowding on two different groups of preschool children and found that only one group was affected by a crowding situation. But they did not discuss the possible reasons for this group difference. The difference in the children's behavior that was seen in the present study and the examination of what foactors were operating to create these differences would not have become apparent if the behavior of only one group of children had been examined. In fact, the awareness of the many factors operating and interacting in the three rooms has been a very important outcome of this study.

Other researchers who have examined the effects of spatial density have found that changes in floor space affects children's behaviors. They found that a spatial density higher than 2.8 m^2/child (30 ft^2/child)

affected the quality and stability of the children's social play (Loo, 1972, 1976, 1979; Rohe & Nuffer, 1977, Shapiro, 1975; Smith & Connolly, 1977). Although some differences were seen, this present study did not find as great a difference in the children's behaviors in the two spatial densities. These differences in the results may be due to the fact that the high density obtained in this research was still considerably lower than 2.8 m^2/child and therefore not significant enough to create large differences in the time spent in different levels of play. In this study there was an attempt made to obtain a high spatial density of 2.5 m^2/child but because of children's absenteeism it remained about 3.5 m^2/child (37.7 ft^2/child). This density was still lower than the 3.25 m^2/child (35 ft^2/child) density recommended by various agencies as the minimum spatial density in a day care center.

Although the effect of spatial density on the children's play behavior was limited, the children's attendance during the high density condition must be examined closely. When the two experimental rooms were subjected to the high density condition on children's behaviors, the attendance dropped. In Room B the attendance dropped to nearly half whereas Room A's attendance did drop but not to the same extent. This affected the study greatly in that this drop of attendance not only lowered the density but also sharply decreased the choice of play partners for the children. However, it is important to note that although this drop in attendance was consistent for Rooms A and B, it was not for Room C where the spatial density remained unchanged. During the entire six weeks of data collection the attendance in Room C remained fairly stable with only one or two children missing at any one time. However, in Room B during the high density condition, many days there were as many as eight

to ten children absent. When the reason for the children's absence was examined, there didn't appear to be any single factor but several reasons from illness to home problems. However, it could be possible that the children in Rooms A and B were uncomfortable and unhappy in the high density and this in some way had an effect on attendance.

Subsequent Effect of High Density

The findings related to the third research question of a subsequent effect of high density upon a return to the low density, showed a subsequent effect of high density in only a small number of instances. When the restraints caused by the high density condition was removed, the percentage of time spent in the majority of categories of social play and cognitive play returned to the same as that of the original low density condition. However, one important occurrence was that there was a general increase of time spent in play and less time spent in non-play when the children returned to the low density condition. Although the children spent more time in play during the low density returned condition, they chose to play either alone or if other children were present there was no use of language. This was seen in the general increase of solitary play and parallel play with no language. Only the females and the older children in Room B showed an increase of time spent in parallel play with language, whereas the males and females, older and younger children in Room A and the males and younger children in Room B spent more time in either solitary play or parallel play with no language. With regard to cognitive play, it was again obvious that the children preferred to play in cognitive activities that allowed for little social interaction. This was evident in the increase of exploratory/functional play in both Rooms A and B and the increase of testing/contesting play seen mainly in Room B.

The activities that were included in these two categories were ones that encouraged more individual play, mainly because of location of the activities. For example, the water and sand tables and the puzzle table (in Room B) really only allowed for a maximum of two children playing there at any one time. Therefore anyone wishing to play alone could be attracted to these activities thus creating an increase in the scores for solitary play and parallel play with no language. This increase of solitary play, parallel play with no language and exploratory/functional play suggested a possible need for the children to have more privacy after the more crowded situation.

Play Theory

With regard to play theory, the younger children did exhibit more social play behaviors at a lower developmental level than the older children. Other researchers have also found that younger children exhibit a lower level of play (Iwanaga, 1973; Parten, 1932; Piaget, 1962; Rubin, Watson & Jambor, 1978). With regard to cognitive play, the younger children in Room A displayed more play behaviors at a lower developmental level than the older children. But in Rooms B and C the younger children exhibited more imitative/dramatic play than did the older children. This was expecially evident in Room B where the younger children displayed almost 9% more imitative/dramatic play than the older children. This may have been due to the younger children not having the small manipulative skills necessary to become involved in constructive play in which the older children spent 15% more time. This difference might have been due to the nature of the teacher-children involvement or the type of constructive activities that were provided. If the activities were fairly complex and if the teacher was not available to assist or guide any of the younger

children in constructing when they lacked confidence, then the children may have become discouraged and not pursued or attempted any constructive activities. By comparison the older children would be more mature physically and able to work independently.

It was also found that the males in the three rooms exhibited more cooperative play and imitative/dramatic play and the females displayed more parallel play with language and constructive play. These sex differences support other researchers' finding that the males engage in activities that induce coordinated and dramatic play, whereas the females engage in more constructive activities (Frost & Campbell, 1978; Rubin, Maioni & Hornung, 1976; Rubin, Watson, Jumbor, 1978; Shure, 1963). The sex differences found in the children's play behaviors were much greater in Room B. This might be another indication of room effect.

Recommendations for Future Research

Research implications arising from the methodology and findings of the study include the following:

1. When examining the effects of spatial density on children's behaviors it is necessary to guarantee a set spatial density. The spatial density of this study was affected by the children's inconsistent attendance. In future research, the change of floor space and the number of children should be controlled in order to maintain a specific spatial density.

2. When using play categories in examining children's play it might be necessary to develop better distinctions between the group play categories (i.e. parallel and coordinated play). The interobserver reliability for social play, in this study, was .75. It seems that it is more difficult, in a short time, to distinguish if the children are

playing next to one another in parallel play or if in fact they are actually playing together in coordinated play.

3. There are many variables operating in the child-environment interactions. It is important to control these variables, such as the adult interaction, in order to determine what exactly influences children's behavior. In order to control adult or teacher interaction the ideal istuation may be for the adults not to become involved with the children during free-choice play.

4. It is important to use more than one experimental group when examining children's behaviors. When there is more than one group involved, researchers could become better aware of factors operating that may not have been controlled and which may be creating variations in the children's behaviors.

5. It is important to examine the effects of spatial density on younger children (less than 4.5 years) to determine if their behavior is affected by a change in spatial density or if their is influenced by the older children in the environment. It may also be important to examine the effects of spatial density on younger children as the total group and older children as the total group and then compare these findings to the findings of this study regarding the effects of spatial density on younger and older children in one group.

6. The amount of time children spend in play varies between rooms and children, and therefore it is difficult to determine an effect of spatial density on children's play. It might be necessary, instead, to examine the stability (i.e. length of time spent at an activity before changing activities) and quality (i.e. complexity) of children's play in

different spatial densities.

7. Play should be examined in all types of settings even those settings which are not often associated with play, i.e. the washroom.

Recommendations for Early Childhood Educators

Implications for early childhood educators which arise from the findings are as follows:

1. It appears that as long as the spatial density remains between 2.9 m^2/child and 4.4 m^2/child some children may react by becoming uninvolved and socialize less with their peers. Therefore it is important that the spatial density of a day care center not exceed 4.4 m^2/child in order to provide an environment for normal child development. However, this study only examined children's behavior in a more dense situation and therefore it still remains a question as to how children in a day care center would react to a much less dense environment. Educators should be aware that there may be an optimal density range in which children function best and anything above or below this range may affect the children's behavior.

2. The effects of spatial density and the time of day on staff and children should be considered. There should be a concern for meeting the needs of all the children in a full-time day care program, especially those in centers of higher densities. There may not be as great a concern for part time day care programs.

3. The effects of spatial density and age should be considered. Programs that include younger children may need to be more concerned with optimal space requirements. The staff need to become aware of some ways of assisting children younger than 4.5 years of age to cope with more crowded conditions. Programs that include family-aged grouping need to

find means of protecting younger children against the social pressures created by crowded conditions. However, when the total group is either all younger or all older children, it may be necessary to examine if there are children in the group that are not able to cope as well in a crowded situation and to help them to cope better.

Summary

This study, on the effect of spatial density on the play behaviors of young children in a day care center, does in no way state that a higher density would be acceptable. The implications from the findings suggest that the minimum optimal spatial density should not exceed the 2.9 m^2/child to 4.4 m^2/child range. It appears that within this range some children tended to become less involved in play and interacted less socially with one another. This was more evident in the afternoon for one room and also evident for the younger children in both experimental rooms. There is a need for further research to determine the effect of spatial density that is below this minimum recommendation.

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APPENDIX A

CHILD SCAN RECORDING SHEET

DATE_____ TIME_____ CODER_____

SET____ BEH____ ACT_____ CH 1 SOC____ COG____	SET____ BEH____ ACT_____ CH 2 SOC____ COG____	SET____ BEH____ ACT_____ CH 3 SOC____ COG____	SET____ BEH____ ACT_____ CH 4 SOC____ COG____
SET____ BEH____ ACT_____ CH 5 SOC____ COG____	SET____ BEH____ ACT_____ CH 6 SOC____ COG____	SET____ BEH____ ACT_____ CH 7 SOC____ COG____	SET____ BEH____ ACT_____ CH 8 SOC____ COG____
SET____ BEH____ ACT_____ CH 9 SOC____ COG____	SET____ BEH____ ACT_____ CH 10 SOC____ COG____	SET____ BEH____ ACT_____ CH 11 SOC____ COG____	SET____ BEH____ ACT_____ CH 12 SOC____ COG____
SET____ BEH____ ACT_____ CH 13 SOC____ COG____	SET____ BEH____ ACT_____ CH 14 SOC____ COG____	SET____ BEH____ ACT_____ CH 15 SOC____ COG____	SET____ BEH____ ACT_____ CH 16 SOC____ COG____
SET____ BEH____ ACT_____ CH 17 SOC____ COG____	SET____ BEH____ ACT_____ CH 18 SOC____ COG____	SET____ BEH____ ACT_____ CH 19 SOC____ COG____	SET____ BEH____ ACT_____ CH 20 SOC____ COG____

(Glengarry Project Report, 1980)

Play and Non-Play Coding Categories
(Glengarry Project Report, 1980)

Non-play Behaviors

1. Non-routine activities (combined to create one category: other):

o - no observable activity. Child is not watching, appears uninvolved and detached.

on - onlooker. Child is passive. Not involved in the activity, but focussed and watching. May be talking to others who are doing the activity.

ω - wandering. Random movement not appearing to have any particular focus, purpose or direction.

→ - transition. Purpose of behavior is to move from one setting to another. Child is not in a play activity. Purpose is clear.

waiting - Purpose is clearly waiting to participate in an activity.

C - conversation. The only activity is conversation. No play activity is in progress or being planned.

2. Routine activities (combined to create one category: routine):

- snack/eating

- tidying

- washroom

- tie shoes

- getting materials

Social Characteristics of Activity

Indicates the degree of coordination of actions. Hierarchical. Code the highest category occurring.

Solitary - Non-coordinated (combined to create one category: solitary)

/ - solitary. Child is apart and alone.

/+ - other child or children are present but are carrying on a separate activity and child is making no reference to them.

Parallel - Non-coordinated (combined to create two categories: parallel with no language, parallel with language):

// - other child or children are present and doing the same or similar activity. There is no language observed.

//- - same as above, but there is language which does *not* relate to the activity.

//+ - language relates to the activity.

Coordinated (combined to create one category: coordinated):

C- - competitive. Activity is coordinated, but there is an attempt by one child to achieve the goal first.

C+ - cooperative. Activity is coordinated with others to achieve a desired common goal or end. No attempt to achieve the goal first by one individual.

Cognitive Characteristics of Activity

Indicates the mental processes involved in the activity. Hierarchical.

Code the highest category occurring.

E - exploratory/functional. Simple motor activities, frequently repeated. Simple investigatory actions about abilities and qualities of self or objects.

C - constructive. Manipulation of objects or materials to create a definable product.

ID - imitative/dramatic. Child is pretending or make-believing. Takes on a role, uses objects or materials as props. Creates an imaginary situation.

TC - testing and/or contesting. Child is making attempt to achieve a set goal, testing self and skills or objects in the process. May be competing with another or others. Accepts prearranged rules and adjusts to them. Includes games-with-rules, games of strategy, chance or physical skill or prowess.